ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

What in the World!

We note food products are up 34 per cent since March. Electrical manufactured products are up about 10 per cent, but will go higher by the first of the year. Rates for electric service are much lower. These are the inconsistencies of NRA. We suppose the principle still holds, however, that the lower the price, the wider the market and the greater the sales, so maybe lower rates will eventually result in a stronger position for the utilities than that obtained by the farmer and manufacturer in the new deal.

●

Utility code action still zero. Construction code split wide open on labor rates. Retail code causing some trouble because salespeople must be paid a minimum wage in this code, but are not covered in the N.E.M.A. code. Price differentials versus no differentials, size of purchase for maximum discount—these are the current N.E.M.A. code problems for the several products. Up to this time all the electrical codes have meant is greater cost through share-the-work action and increase of minimum wages. But progress is being made and stabilization will be improved after the agonies of organization and agreement are over.

●

We hope the Roosevelt shift proves as powerful as the Warner and Notre Dame shifts. From the Columbia academic economists to the Cornell agricultural economists is a movement at least closer to earth. Look for a dirt dollar instead of a paper dollar.

●

Watch St. Louis. A sharp drop in utility rates to an all-time low is being followed by a highly aggressive and highly organized sales program. The method is straight orthodox distribution and selling. How fast will sales be made and what will be the costs and returns? Congratulations to Charlie Michel for a very constructive effort. As a contrast, what is T.V.A. Lilienthal going to spring on the commercial fraternity?

●

Business will be better next year. This is the general sentiment of electrical manufacturers we have consulted.

L. W. W. MORROW, Editor

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Publishing Director

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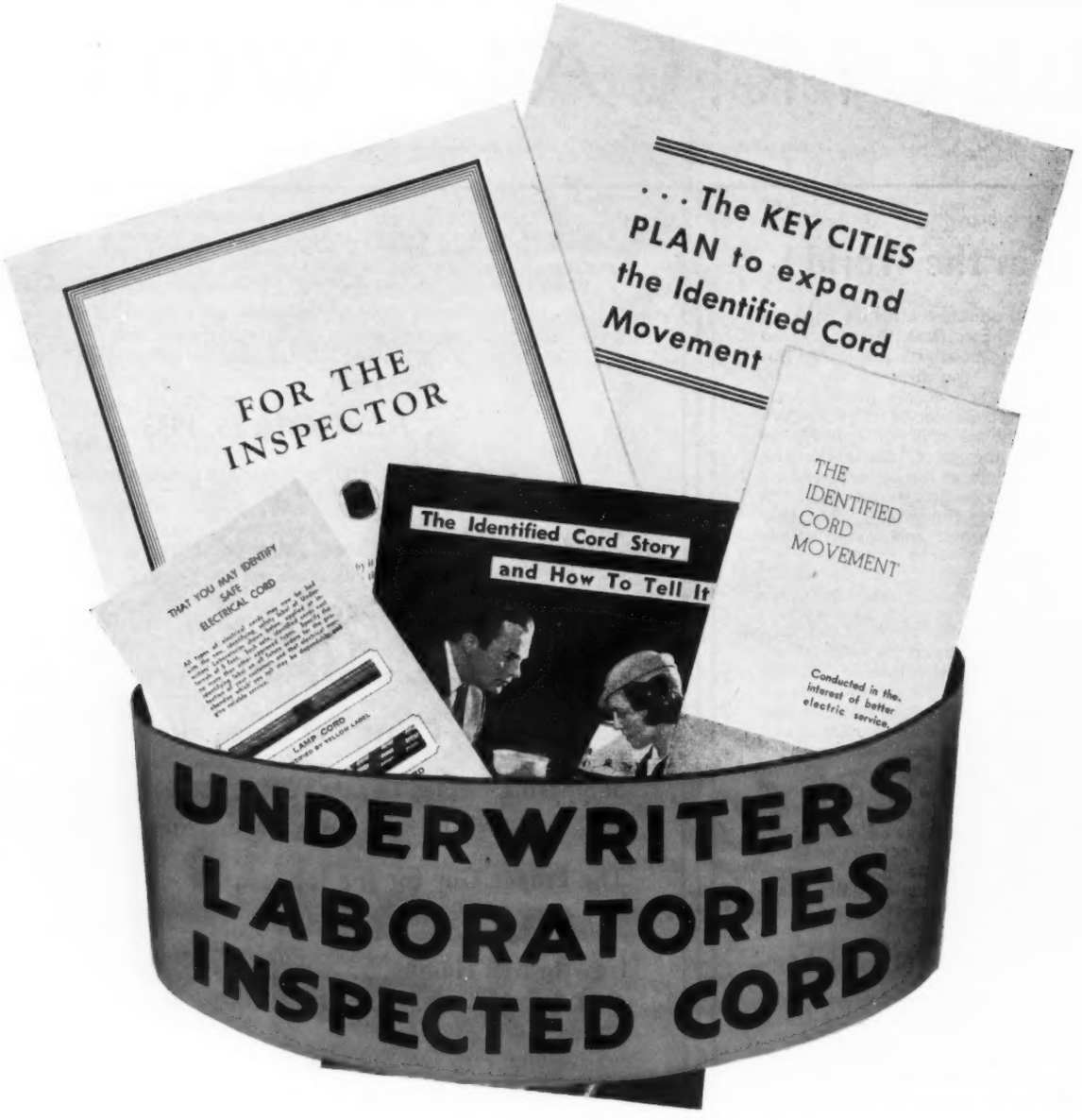
FOR THE INSPECTOR
. . . The KEY CITIES PLAN to expand the Identified Cord Movement
THE IDENTIFIED CORD MOVEMENT
Conducted in the interest of better electric service.
The Identified Cord Story and How To Tell It
THAT YOU MAY IDENTIFY SAFE ELECTRICAL CORD
LAMP CORD
UNDERWRITERS LABORATORIES INSPECTED CORD

A Report to the Industry.....

THAT many hundreds of thousands of dollars are lost annually by utilities on trouble calls due to inferior cords on lamps and appliances—that a huge amount of revenue is lost on appliance and lamp outage where cords have broken down—that good will toward things electrical suffers when poor cords give short and dangerous life . . . .

Upon that premise twenty-seven cord manufacturers instituted the Identified Cord Movement—to stop the sale of unapproved cords.

The first step was the placing of the bracelet label reading "Underwriters' Laboratories Inspected Cord" on every five feet of cord—making it simple for everyone to identify approved cords.

The next step required the setting up of a plan enlisting the cooperation of utilities, retail outlets, electrical leagues, and electrical inspectors in discouraging the use of unapproved cords.

This is a report of their accomplishments:

ELECTRICAL WORLD

Established 1883—McGraw-Hill Publishing Company, Inc.

for the Week Ending

November 25, 1933

L. W. W. MORROW, *Editor*

Crash the Gates

IN UNION there is strength. It is high time that the functional groups in the utility business applied this principle in order to change the present industry organization for the better. Sufficient time has elapsed to prove that present policies and practices are inadequate and are causing a deterioration in the morale and in the competency of the individuals in the business. The segregation of utility people into cells of silence, with orders to stay home and concentrate upon their individual tasks, has not worked to the advantage of the industry.

Until recently there were many committees at work both locally, regionally and nationally; there was an organized compilation and dissemination of information that could be applied; there were organized efforts to develop plans for improving all aspects of the business; there were opportunities for frequent personal contacts to exchange experiences and opinions. These things were good and had developed in response to a need, but they were discarded suddenly and completely. They were said to be expensive, overdone and unnecessary.

Perhaps some of the old N.E.L.A. activities were overdone, but any one who had an intimate and long experience with the committee work in engineering, accounting, commercial and public relations knows that this work was necessary and was good and should not have been discarded; it should have been improved, controlled and further developed. Experience in the present cells of silence proves the point. The engineers, the commercial men, the accountants and the executives admit the failure of the new policies and plead for the aid, the contacts and the information they used to get and now need badly. There must be local, regional and national organizations with definite channels for group association, discussion and action if the industry and its workers are to progress. There must be opportunity for the exchange of information and experiences and for devising joint plans that will help the industry. The start is the organization of state or regional committee on the firing line.

Why not change the present policies and institute new ones? The way to do this is for the several functional groups to come together, develop their plans and programs and then present these to the industry chief executives for approval. If their recommendations are reasonable and their plans are sound they will be approved. But only the groups concerned know what is needed, how it can be had and why it will produce good results. This is their province, and new policies and plans cannot and should not be produced and handed to them by chief executives. Thus, based upon overwhelming sentiment that present policies and practices are not adequate in the light of experience, we hope the accountants, engineers, commercial men and functional executives will say so and act on their own initiative to change them. We feel certain they will receive sympathetic attention and hearty approval from chief executives for changes that will improve present conditions. But they must crash the gates in their own behalf and initiate the proposed changes.

Business conditions and post-graduate study in engineering

Will continued industrial activity at a lower level than that during the boom years cause a continuation of the marked increase in graduate study in engineering? This is a question that faces colleges and universities throughout the country, and the answer seems to be in the affirmative, for institutions everywhere report considerable growth in graduate enrollments despite retrenchment and curtailment of graduate fellowship funds.

The active interest in graduate study in the country is one of the pronounced trends in engineering education during the last decade. Enrollments in graduate courses increased from about one thousand in 1921 to more than three thousand in 1931, and since then the growth has been even more pronounced. Part of this increase has been attributed to the failure of recent graduates to obtain positions immediately after receiving their first degrees. These young men, wishing to maintain the normal rate of intellectual growth of their undergraduate days, have found graduate study the only outlet to their ambitions. They have further recognized a condition that has become apparent in industry—a distinct premium is being placed upon the additional period of study in the graduate school.

Institutions situated in different environments have met this demand in different ways. The commonest has been through the provision of more full-time graduate courses with a view to building more comprehensive curricula in advanced subjects. A very interesting variant of the customary method has been through the provision of post-graduate courses on a part-time basis. A number of institutions in urban communities have provided graduate courses in the evening during the past few years. Prominent among these are the Massachusetts Institute of Technology, Union College, Polytechnic Institute of Brooklyn, University of Pittsburgh, University of Pennsylvania and Columbia University. The Polytechnic Institute of Brooklyn, as an illustration, introduced evening graduate instruction eight years ago, after twenty years of experience with evening engineering of college grade. It now has 250 graduate students in engineering and chemistry and last June graduated 22 with master's degrees. Among the 41 courses to be offered during the coming season are the following of interest to electrical engineers: Advanced circuit theory, power transmission and distribution, electromagnetic theory, electrical protection in power systems, and theory of vacuum tubes and their circuits. In addition there are a number of graduate courses in physics, mathematics and chemistry.

This movement in engineering education will be watched carefully by engineers and educators. Apparently the answer to the moot question of the length of the engineering curriculum is being given through this normal evolution toward advanced study leading to higher degrees, rather than through the lengthening of the undergraduate curriculum itself.

Dollars and service point to distribution

When all is said and done the economic and operating efficiency of a light and power company is measured by its distribution system. Maximum investment, maximum maintenance and operating costs, hazards to service, penalties for improper operations reflected in revenues and other important balance sheet elements are concentrated in the distribution system. Despite this the distribution system is the neglected orphan on many properties. The executives and senior engineers devote time and effort to generation, transmission and substation divisions and look upon distribution as a necessary mass of inconsequential items each of which is too small to justify their attention. They forget that both service, operating and investment values are concentrated in this realm of neglect.

Now is an opportune time to study and revamp distribution. An analysis of the economic size of primaries, transformers and secondaries, an investigation of voltage to ascertain if revenues are maximum and outages a minimum, the determination of a logical plan for extensions and additions, improving the operating organization—many things can be done that need to be done. Most distribution has never been engineered and never studied, but grew in haphazard increments. The present as well as the future dividends of the industry lie largely in improving distribution.

THE WEEK

Electric Research Active in Depression

THAT the depressing effect of current industrial conditions has not yet extended to the field of electrical research seems apparent in the success of the recent annual meeting of the committee on electrical insulation of the Division of Engineering and Industrial Research, National Research Council, held at the University of Pennsylvania last week. Not only was the program extensive, as in former years, but the variety and importance of the results led to many favorable comments. More than 100 registrations were made at the meeting.

The committee, which concerns itself with all matters bearing on the theory, experimental study and performance of dielectric materials as utilized for electrical insulation, has as its chief activity the collection, co-ordination and discussion of the results of research and their application. These activities are headed up each year at an annual meeting notable for its informal character. It is designed principally for the presentation and discussion of progress reports of active researches.

This year's meeting began jointly with a meeting of the Philadelphia section of the American Institute of Electrical Engineers. The subject was the "Committee on Electrical Insulation, N.R.C." Addresses were made by President J. B. Whitehead of the institute and Messrs. D. M. Simmons of the General Cable Corporation and W. F. Davidson of the Brooklyn Edison Company, who explained the purposes and reviewed the recent work presented by the committee on electrical insulation.

Technical sessions on Tuesday and Wednesday ranged from recent advances in physical and chemical theory to the most practical and prosaic problems of the insulation of commercial circuits. Following the usual review from the chair of the year's progress in dielectric research, Dr. W. F. G. Swann of the Bartol Research Foundation presented a paper entitled "The Positron," which had, in effect, an exposition of modern atomic theory and experimental evidence for its principal features. Prof. Karl F. Herzfeld of Johns Hopkins University lectured on present theories of conduction and breakdown in solid conductors and semi-conductors, in which many anomalous properties heretofore not understood were explained in terms of modern atomic and molecular theory. Other contributions from the field of basic experiment and physical theory were those of Messrs. Oncley on molecular orientation and dielectric loss and of J. B. Whitehead and G. M. L. Sommerman on polar molecules in non-polar solvents, in which important new information was brought out as to the influence of polar molecular orientation on the behavior of dielectrics as insulators in practice. It is now apparently agreed that at commercial frequencies the contribution of these phenomena to the total dielectric loss is negligibly small.

The anomalous properties of liquid dielectrics were reviewed by V. Karapetoff in discussing a monograph, "Liquid Dielectrics," by A. Gemant, published under the auspices of the committee; in papers on space charge, by J. B. Whitehead and E. E. Minor; on breakdown strength, by F. M. Clark, with particular reference to gas content, and by W. F. Davidson, as related to hydrostatic pressure. The influence of pressure on breakdown is now seen to be closely related to the amount of absorbed gas in the liquid. Of especial interest was a paper by J. S. Long on vegetable oils, indicating progress in the much more accurate analysis of this type of oil than ever before reported, and suggesting the possibilities of the synthesis of oils for special purposes.

As is always the case at these meetings, the problems of impregnated paper power cables received particular attention. New experimental results on the laws controlling gaseous ionization were reported by Chester L. Dawes of the Harvard Engineering School from a university laboratory and by K. S. Wyatt of the Detroit Edison Company from a utilities research laboratory. Contributions to the discussion of these papers by D. W. Roper, R. W. Atkinson and others indicate an increasing knowledge of the laws governing internal gaseous ionization, now commonly recognized as the chief cause of deterioration in cables of this type. J. C. Balsbaugh of the Massachusetts Institute of Technology reported further development and uses of the high-sensitivity power factor bridge, reported at earlier meetings. Rubber as an insulating material received special attention, particularly in a paper by A. H. Scott of the Bureau of Standards, as well as in other reports, and noteworthy increase of knowledge and extension of the range of service of this important material were indicated. A number of other interesting reports on the properties of materials were included in the program.

Dr. J. B. Whitehead of Johns Hopkins University is chairman of the committee on electrical insulation. This year the program was assembled and the annual meeting was conducted by Vice-Chairman W. A. Del Mar of the Habirshaw Cable & Wire Corporation.

Legislation of doubtful legality has concentrated enormous power in the hands of the President, so that we now have a government of men and not of law. If the NRA proceeds as at present, bureaucracy will be rampant.

PHILIP CABOT.

Professor Cabot, of the Harvard Graduate School of Business Administration and one-time utility executive, told the embattled-for-a-sound-dollar New England Council this week: "The forgotten man today is the creditor . . . those hard-working, thrifty people who for years have been saving part of their income and putting their savings into life insurance or savings banks."

▼

Will Vapor Lamps Light Highways of the Future?

Progress in the practical evolution of the vapor lamp, especially the sodium lamp for highway lighting, is accelerating. There are already three experimental installations in this country, a General Electric project near Schenectady and two Westinghouse trials, one at Port Jervis, N. Y., and the other at Hamilton Beach (Borough of Queens), New York City, the latter just about to be energized. In enumerating these installations Vice-President R. D. Mailey of the General Electric Vapor Lamp Company told the American Institute of Electrical Engineers, New York Section illumination group, this week that there was a fourth installation in progress in Massachusetts.

The high efficiency, 35 to 50 lumens per watt; the low intrinsic brilliancy and low glare factor and the high factor

of visual acuity with the monochromatic source are winning the sodium lamp acceptance for the field of highway lighting. The relatively low levels of illumination required for this purpose not only render the color quality a matter of minor importance but actually give free play to its superiority in contrast and silhouette values.

Mr. Mailey emphasized the extensive installations throughout all northern Europe. Altogether some 1,600 units are in service for highway lighting there, between 500 and 600 of them in an Antwerp, Belgium, tunnel that is said to surpass New York's Holland tunnel in efficacy of illumination. Originally designed for "Mazda" units, the intensity was practically tripled without raising the energy input, at the same time affording practically glareless illumination.

The Westinghouse installations are double-anode, self-rectifying units that operate on the conventional two-wire, 220-volt or series constant-current circuit that obviate the four-wire a.c./d.c. circuits in vogue on most of the European installations. One of the exhibits at the meeting was a 300-watt unit that gives 15,000 lumens or 50 lumens per watt, the largest and most efficient unit so far produced in this country. Still higher efficiencies are foreseen by Mr. Mailey, but he doubted that we would ever reach in practice the 300 lumens attained by Dr. Pirani in Germany under ideal laboratory conditions.

Mention and demonstrations were made also of the high-pressure mercury-vapor lamps of the type in service on an English highway. These General Electric Company, Ltd., units have a wattage of 420 with lumen output 2 to 2.5 times that of the low-pressure mercury lamp. To improve to 83 per cent the low power factor that would otherwise result from the necessary ballast reactor a condenser of 20 mfd. is used with each lamp.

In the discussion S. G. Hibben cautioned against the expectation that these new lamps would immediately supplement the conventional filament lamps for highway work. Prices are still high and must necessarily remain so during the rapid evolution that is taking place. Nevertheless, they do afford the potentiality to bring highway lighting in the United States to proper levels without materially increasing present wattages in the accomplishment.

▼

Motor Frees Own Bearings

By providing small motors subject to extremely low ambient temperatures with a simple clutch built into the motor itself Westinghouse engineers have eliminated to a large extent the problem of damage to such motors through frozen bearings. By means of the centrifugal clutch a succession of rapid blows of increasing intensity is transmitted to the motor shaft. The motor is free-running until coming up to speed and resumes free-running upon reductions in speed.

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Heavy-Duty Appliances in California Program

After consultation with manufacturers, wholesalers and dealers Southern California Edison Company established the following quotas for its campaign to produce $4,000,000 additional gross revenue within a year (ELECTRICAL WORLD, November 11, page 612): 5,200 ranges, 16,000 refrigerators, 4,000 water heaters, 50,000 lighting units, 40,000 small appliances, 4,000 washers, 1,000 ironers, 10,000 hp. in air heating and air conditioning and 5,000 hp. in hotel and restaurant equipment.

A unique and impressive feature of the program is a financing plan which has been worked out with the company and the Commercial Investment Trust Corporation to finance dealer conditional sales contracts on ranges, water heaters and refrigerators without recourse. By accepting such terms as the maintenance of adequate service department, merchandise display, sales organization and delivery service, the provision of complete monthly confidential reports of appliance sales, the securing of an adequate down payment and the supplying of acceptable credit information, the dealers thus obtain a financing service on far more reasonable terms than possible for themselves. A charge of 5 per cent of the cash balance is made to compensate for the cost of collections, disposal of reverts and losses on reverts.

Credit plan features

Dealer identity is preserved because the dealer handles all details in the sale and servicing, keeping the company only as a financial agent. Out of the plan the dealer gets added profit, as much as from 3 to 10 per cent. He can do more business, employ more salesmen, increase his inventory. Collection costs are eliminated, reserves for losses unnecessary, and repossessions are not his loss. The credit of the consumer and not the dealer is involved. The dealer has no contingent liability on contracts. He operates on a cash basis. His credit position is improved and he can discount his bills. His sales possibilities are immeasurably increased since the company can take all of the good contracts that he can produce.

By incorporating a trial or demonstration program to stimulate range sales on electric ranges the company believes that acceptance of and demand for this type of electric service will be measurably increased. The "Range Sales Booster Plan" calls for the company to provide a special model range to be used for trial purposes (five different makes of range at present). Any dealer will be privileged to offer to place one of these ranges in the home of a home owner on trial for the nominal charge of $1.50 per month. The Edison company will provide the wiring in exchange for the customer's old cooking equipment. In the event the customer does not have an old range to turn in the company will contribute $25 toward the cost of the wiring. The dealer will receive a fee of $7.50 from the Edison company for each trial installation made by the company providing he does not sell a permanent range to the customer within 90 days. The trial plan will not be available to renters, although the wiring allowance of $35 will be made by the company in cases where renters purchase a range outright from a dealer.

In addition to the merchandising program, a complete plan for development of power load has been developed by R. C. McFadden, new-business manager. This part of the load-building and revenue-producing program calls for the addition of 86,951 hp. of load.

In a statement of policy the following principles have been announced:

1. The promotion but not the direct sale of ranges, refrigerators, air heating in stationary units, commercial cooling, washers and ironers. The company will pay the cost of wiring up to $35 in exchange for customer's old range.

2. The promotion and direct sale of lighting units, water heaters, lamps and appliances.

3. Range and water heater sales booster plan: The company will provide suitable ranges for trial purposes to home owners only. Dealers will be allowed to take trial orders. If no old range is turned in the company will advance $25 toward wiring, the customer to pay the balance. The dealer will receive $7.50 commission on each trial order provided he does not make a permanent range sale within 90 days. Trial ranges will not be sold.

4. All dealer contact and promotion men will be on a salary basis. Lighting unit canvassers will be on a commission basis.

As an integral part of any plan the company reserves the right to (1) always sell employees any article for their own personal use at a discount; (2) merchandise any and all articles in any district where, in our judgment, the dealers fail to develop sales on a satisfactory basis, as indicated by our established quotas.

▼

No Successor for E. N. Hurley

The position of co-receiver of the Middle West Utilities Company, vacated by the sudden death of Edward N. Hurley, will not be filled. Charles A. McCulloch, co-receiver with Mr. Hurley, will continue as sole receiver,

Federal Judge Walter C. Lindley has announced. Messrs. Hurley and McCulloch were made receivers by Judge Lindley in the spring of 1932. A comprehensive reorganization of the company's executive personnel and operating policies was effected by the two men. D. C. Green was selected as president of the company a few months ago.

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P.W.A. Rules on Bonds; T.V.A. Power for Jackson?

Public Works Administrator Harold L. Ickes has announced that P.W.A. will accept revenue bonds issued against municipal power plants where the project is regarded as a sound and self-liquidating one; where there is doubt of this general municipal obligation bonds will be required. Where insistence upon general obligation bonds constituting a lien upon the local tax revenues operates to defeat the municipal power project Secretary Ickes hopes to make other arrangements.

Rejection of several large municipal power projects by electorates throughout the country has been attributed to the requirement of general obligation bonds as security for P.W.A. loans and Mr. Ickes has announced his intention of looking into this situation with a view to ascertaining the true facts.

P.W.A. is reported to be considering the possibility of setting up for the Columbia River Basin development in Oregon a federal body and organization similar to the Tennessee Valley Authority. Simplification and co-ordination of efforts at Bonneville and Grand Coulee are foreseen as the advantages of such a procedure.

Representative Randolph of West Virginia has announced that $60,000,000 of P.W.A. funds will be sought for a hydro-electric power development on the James River, first suggested more than twenty years ago.

Marshall Dana, Portland, Ore., regional adviser of the Public Works Administration, stated last week that the expectation of industries being attracted to Grand Coulee by cheap power was a vain hope. "Power constitutes too small a part of the overhead expense of industry to attract it here," he said. "It is a misrepresentation of facts to put over the idea that there will be any great industrial city within the area of the dam."

Jackson, Miss., eyes T.V.A. power

Mayor W. A. Scott of Jackson, Miss., the largest city in that state, reports a call upon the Tennesssee Valley Authority for information on how the city of Jackson would have to proceed to get electric energy from Muscle Shoals. Mayor Scott was accompanied to Tupelo, Miss., by Commissioners A. F. Hawkins and R. M. Taylor. The three officials conferred with directors of the Tennessee Valley Authority while there. The Mayor has written Director Lilienthal of a special meeting on December 15 of the Mississippi Municipal Officers' Association. Mayor Scott is executive secretary of the state association.

Denial that the T.V.A. is sponsoring the Standard Aluminum & Alloy Corporation in the latter's application for a P.W.A. loan has been made by Director David E. Lilienthal, general counsel for the Tennessee Valley Authority.

Nothing Rational Allowed?

Immeasurably speeded, the national drama of recovery sweeps on to a climax. Washington will not hear or consider opposition to the monetary policies that are strangling business, fitfully struggling as it is to remain alive. Hence, au revoir Mr. Woodin, good-by Mr. Acheson, and gone—Mr. Sprague. Censorship of the Treasury Department may not have come soon enough to forestall outside knowledge of supposed plans to devalue and temporarily stabilize the dollar before Congress can intervene, or any one else in all probability. Opposition, however, grows by leaps and bounds, Bernard Baruch, New England Council, U. S. Chamber of Commerce, and the all-but-forgotten non-agrarian citizen. Something more than Thunder on the Right.

Facts and figures of the week but reflect loss of confidence in the dollar and its effect upon trade. Government bonds, relieved of Federal Reserve buying and deserted by nervous capital, drop further; general bond market slumps; stocks pause after decisive gains; commodities, weary of fear stimuli, erratically drift up and down. Activities show little change; energy production firm at last week's levels; carloadings off 30,109 units (in election week); bituminous coal production off; steel at 27 per cent, up somewhat; automobile production continues decline, sales steady; cotton forwardings drift lower; lumber orders exceed production in sharp upswing.

News of the week involves: Increased activity in the slashing of retail, wholesale and manufacturers' prices to meet sales slump and to cut inventories; Washington considers direct credit to the consumer by the government to stimulate buying; "subsistence homesteads" for those who may not again be able to find employment may be government-built, and fears of buyers' strike are heard. Somehow the expiration of PRA. blanket codes on December 31 seems to spell an end of even the more formal pacts.

E.E.I. Code Advances

With the return of questionnaires by all operating electric companies of the nation to the Edison Electric Institute another step toward action on the light and power code for the electrical industry will have been taken. The questionnaires seek specific information regarding action under PRA and effects upon payrolls. Leighton B. Peebles, deputy administrator, has indicated that an early hearing on the NRA code is possible.

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N.E.M.A. Code Supervisors

In addition to the supervisors previously appointed for a number of product classifications under the N.E.M.A. code (ELECTRICAL WORLD, October 28, page 549), the National Electrical Manufacturers Association has selected B. W. Kerr of the Railway & Industrial Engineering Company and L. C. Nichols of the Allis-Chalmers Manufacturing Company to head the supervisory agency for transmission and distribution apparatus.

Another Employee Plan

Pennsylvania Power & Light Company has announced an employee-management co-operation plan to have been adopted by its employees by an overwhelming majority. Ninety-six per cent of the 4,254 employees of the company voted on the scheme in a system-wide election and 91 per cent of those voting favored it. The plan was developed by delegates chosen by the employees who met with company officials in a three-day session here. It provides a means of arriving at a common viewpoint, through co-operation, and through collective bargaining, to solve problems that may occur.

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Buzzard Point Station

Operation of the new Buzzard Point steam generating station of the Potomac Electric Power Company (ELECTRICAL WORLD, November 4, page 580) was inaugurated on November 16. This plant has an initial capacity of 35,000 kw. and will be the base load station of the Washington, D. C., power system, operating in connection with the Benning steam plant and hydro-electric supply from Safe Harbor.

▼

Insull Pensions End

Directors of Commonwealth Edison, Public Service of Northern Illinois, Peoples Gas Light & Coke and Peoples Gas Subsidiary this week voted to discontinue, effective December 31, the aggregate $21,000 in annual pensions paid to Samuel Insull. Mr. Insull's refusal to return from his Greek refuge is said to have initiated the action.

Coming Meetings

American Society of Mechanical Engineers—New York, N. Y., December 4-9. C. W. Rice, 29 West 39th St., New York.

American Physical Society — Annual meeting, Boston, Mass., December 28-30. W. L. Severinghaus, Columbia University, New York.

American Institute of Electrical Engineers—New York, N. Y., January 23-26. H. H. Henline, 29 West 39th St., New York.

▼

Midland United Probe Held; Reorganization Final Goal

Financing operations of the Midland United Company, a holding company of the Insull group, were outlined at hearings held last week before the Federal Trade Commission in its inquiry into power and gas utilities. Examiner A. J. Hughes of the commission detailed transactions of the company, which had capital stock outstanding December 31, 1931, with a stated value of $71,340,216. Consideration received for these stocks was $96,909,065, it was shown, the difference being designated as capital surplus. Approximately 55 per cent of the $96,000,000 item was issued in payment or exchange for the securities of other companies and $38,000,000 of this portion was issued to Insull companies. Mr. Hughes testified that on the basis of audit reports of the properties the values shown on the books of Midland were not justified.

Substantial loans to officers and employees were outstanding at December 31, 1931. A loan of $100,000 to Samuel Insull in January, 1932, was not recorded in the Midland company's minutes, Mr. Hughes testified, and it was made less than three months before the collapse of Middle West Utilities and other Insull properties. A reserve against probable loss from the loan was set up by the company. Midland Utilities Company was organized in 1923 to act as a holding company for numerous properties and became a subsidiary of Midland United when the latter was organized. Mr. Hughes said that on December 31, 1932, the stated value of the 378,300 shares of Midland Utilities was written down from $14,398,000 to $3,783,000. The difference was credited to capital surplus to permit writing off of losses sustained by the company and reserve for possible losses. A revised balance sheet as of December 31, 1932, of the Middle West Utilities Company was introduced in the record and showed a total deficit of $177,873,347 in the earned surplus account, thus wiping out the equity of common-stock holders amounting to $155,611,557.

Reorganization of the two Midland holding companies into one is the ultimate goal of its executives, Roy Garrett, attorney for the interests, stated in a report to the commission as the hearings concluded. He said a valiant effort is being made to develop a sound structure from properties which he described as "very fine." Several years will be required to do this, he said, since the companies have been depression victims. The merger would have only one class of capital stock and no funded debt or fixed charges under the present plans.

Niagara Hudson examined

Affairs of three operating companies of the Niagara Hudson Power Corporation group have been examined at recent hearings before the Federal Trade Commission. Economist W. J. Warmack outlined the growth of the Municipal Gas Company of the city of Albany up to its merger in 1927 with the Troy Gas Company, Adirondack Power & Light Corporation, Cohoes Power & Light Corporation and Fulton County Gas & Electric Company.

Net write-up in fixed capital of $804,761.28 was shown by Mr. Warmack in the Albany property between 1885 and 1911. Cash dividends totaled $15,158,275.57, ranging from 64 per cent in 1915 to 6 per cent in 1886. He testified that the Cohoes property showed a write-up of $4,368,166.97 at the time of acquisition by Cohoes Power & Light in 1918. This was later reduced to $2,531,037.67 by a write-off ordered by the State Public Service Commission.

Lewis G. Prichard, commission economist, asserted that the Peoples Gas & Electric Company of Oswego, N. Y., showed an average return on fixed capital, after deducting federal income tax, of 10.10 per cent between 1925-31. Return on common stock equity ranged from 6.47 per cent in 1925 to 12.72 per cent in 1931. All common and preferred stock were owned as of December 31, 1931, by the Oswego River Power Corporation, Niagara Hudson subsidiary.

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New York Utilities Protest Tax

Informal notice by every utility in New York City affected by the new 5 per cent city tax on gross earnings for six months has been served upon Controller George McAneny that the tax will be contested. The levy, aimed at providing funds for unemployment relief, was to have yielded $5,000,000.

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Utility Loan Pays City Wages

Because the Public Service Corporation of New Jersey loaned the city of Newark $900,000 that municipality was able to meet its November 1 payroll to municipal and school employees after two weeks of uncertainty. How the November 15 payroll, now due, will be met is still uncertain.

Associated Receiver Asked; Securities Order Modified

Back into the limelight come the troubled affairs of the Associated Gas & Electric Company. For the second time within recent months a receiver has been asked (ELECTRICAL WORLD, September 30, page 423). Last week Lindsey E. Bird of Brookline, Mass., owner of $10,000 bonds, filed a petition in United States District Court asking that an equity receiver be appointed. The suit seems to involve the same questions that were decided in favor of the company on motion for a temporary injunction in the New York Supreme Court last summer (ELECTRICAL WORLD, August 19, page 229).

The petition estimated the company's liabilities at $509,000,000. Assets were at par at $694,843,704, with their fair value placed at not more than $300,000,000. Mr. Bird represented himself to be acting in behalf of holders of $180,000 of debentures bearing 5 per cent interest and maturing in 1965. The liabilities, it is alleged, are junior to obligations of subsidiary operating and sub-holding companies which are said to be in debt for $250,000,000, while the assets, according to the petition, have been transferred to the Associated Gas & Electric Corporation.

Revocation order modified

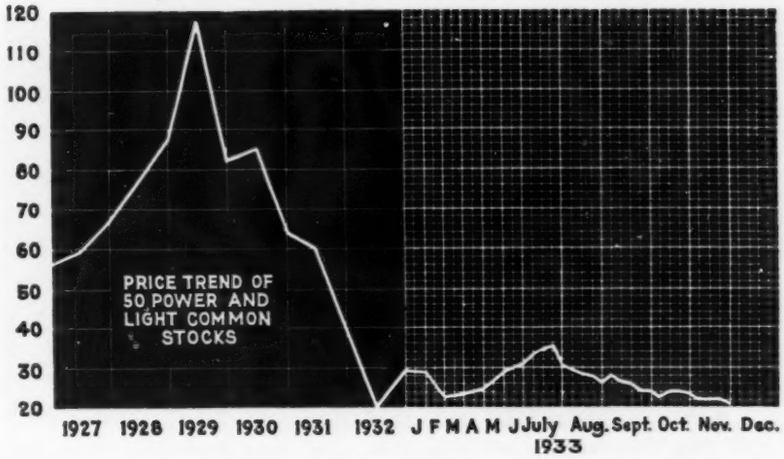
Massachusetts Public Utilities Commission has handed down an order modifying the order of Director Hull of the department's security division in connection with the latter's revocation of the registration of the Associated Gas & Electric Securities Company, Inc. (ELECTRICAL WORLD, October 28, page 550). The commission, reviewing the facts in the case, has ordered that the registration as a broker be suspended for a period of three months from date of the order (November 9). "The finding of the director," the order says, "does not set forth the reasons for basis of his finding of dishonesty or lack of good faith. . . ." In view of our decision to discipline the registrant for the sale of a security through the solicitation of an agent not registered we do not deem it necessary to make any specific finding as to the allegation of fraud in making the sale. In view of the evidence, we are of the opinion that the suspension of the registration of the registrant will be adequate penalty."

Associated Gas & Electric Corporation and the Associated Gas & Electric Securities Company, Inc., have demurred to the injunction bill filed against them and the Associated Gas & Electric Company, a New York corporation, by Tessie Berwick of New York (ELECTRICAL WORLD, September 30, page 423). The suit was filed to compel the Associated Gas & Electric Corporation, a Delaware corporation,

to reassign to the Associated Gas & Electric Company, a New York corporation, certain assets alleged to have been transferred by the latter to the former. The Associated Gas & Electric Company of New York also moved in Chancery Court to dismiss the action filed against it by Mrs. Berwick to enjoin the company from carrying out its recapitalization plan. The motion argues that Delaware courts have no jurisdiction over the New York corporation.

West Virginia holders of securities in the Associated Gas & Electric Company and affiliates and subsidiaries have been advised to oppose a proposed reorganization of securities by refusing to deposit securities they may hold. An official statement issued from the West Virginia State Auditor's office at Charleston characterized the plan for rearrangement of capitalization as "unjust, unethical and against all interests of the present bondholders." Harold K. Bradford, deputy securities commissioner, who signed the statement, said that because the solicitations for securities have been made by mail the securities department has been powerless to interfere. The assistance of the Federal Trade Commission was also sought, but the first solicitations were made before July 27, 1933, eliminating the necessity of submitting the plan to it.

Utility Shares Again Decline



Dropping to the lowest point since April, the "Electrical World" stock average stands at 21.0, though it was 22.4 last week. The general market continued upward.

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Current Earnings Reports of Electric Light and Power Companies

Operating Companies

	1933	1932	Per Cent Increase	Operating Ratio 1933	Operating Ratio 1932
Alabama Power					
(Year ended September 30)					
Gross earnings	$15,475,852	$16,081,791	− 3.8	49	48
Net earnings	7,918,519	8,347,701	− 5.1	..	..
Net balance	902,859	1,416,294	− 36.3	..	..
Cleveland Electric Illuminating					
(Year ended September 30)					
Gross earnings	22,019,418	24,337,131	− 9.5	77	70
Net earnings	5,029,366	7,322,888	− 31.3	..	..
Net balance	4,400,550	5,723,092	− 23.1	..	..
Consolidated Gas, Electric Light & Power of Baltimore					
(Year ended September 30)					
Gross earnings	20,216,418	20,446,952	− 1.1	68	67
Net earnings	6,340,546	6,624,782	− 4.3	..	..
Net balance*	4,355,712	4,768,517	− 8.7	..	..
Consumers Power					
(Year ended September 30)					
Gross earnings	26,179,985	28,889,475	− 9.4	55	50
Net earnings	11,679,595	14,371,071	− 18.8	..	..
Net balance	2,869,732	5,810,837	− 50.5	..	..
Detroit Edison					
(Year ended October 31)					
Gross earnings	41,649,148	44,633,180	− 6.7	68	70
Net earnings	13,171,876	13,236,405	− 0.5	..	..
Net balance*	6,590,228	7,187,029	− 8.3	..	..
Duquesne Light					
(Year ended September 30)					
Gross earnings	23,886,697	25,985,460	− 8.1	43	43
Net earnings	13,546,589	14,868,665	− 8.9	..	..
Net balance	9,689,262	11,122,223	− 13.6	..	..
Georgia Power					
(Year ended September 30)					
Gross earnings	22,113,729	23,105,788	− 4.3	48	50
Net earnings	11,593,088	11,654,630	− 0.5	..	..
Net balance	2,504,514	2,565,039	− 2.4	..	..
New York Edison					
(Year ended September 30)					
Gross earnings	67,052,564	71,186,069	− 5.8	72	68
Net earnings	18,779,061	22,707,254	− 17.3	..	..
Net balance*	24,461,392	27,376,559	− 10.7	..	..
Northern States Power (Minn.)					
(Year ended September 30)					
Gross earnings	27,259,790	28,940,863	− 5.8	63	61
Net earnings	10,038,216	11,352,680	− 11.8	..	..
Net balance*	6,508,789	7,876,342	− 17.3	..	..
Philadelphia Electric					
(12 mos ended September 30)					
Gross earnings†	45,018,373	47,522,184	− 5.2	50	52
Net earnings	22,414,091	22,584,888	− 0.8	..	..
Net balance	14,545,006	14,570,911	− 0.8	..	..
Southern California Edison					
(12 mos ended September 30)					
Gross earnings	26,360,379	28,039,015	− 5.9	47	43
Net earnings	14,021,811	15,913,648	− 11.9	..	..
Net balance	3,142,513	5,212,807	− 39.7	..	..
Tennessee Electric Power					
(Year ended September 30)					
Gross earnings	11,336,146	12,220,858	− 7.2	57	53
Net earnings	4,839,409	5,094,511	− 5.0	..	..
Net balance	621,892	936,092	− 33.5	..	..
Union Electric Light & Power					
(Year ended September 30)					
Gross earnings	26,882,573	28,494,004	− 5.7	56	54
Net earnings	11,860,967	13,190,997	− 10.1	..	..
Net balance	8,931,380	8,711,639	− 2.5	..	..

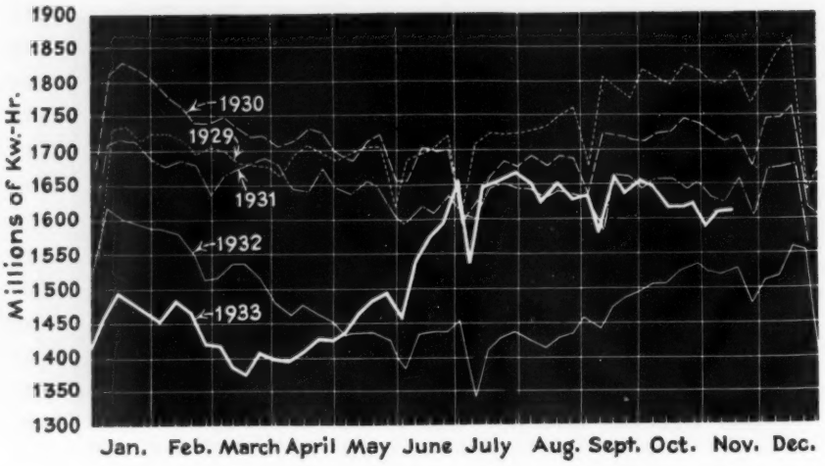
Holding Companies

	1933	1932	Per Cent Increase	Operating Ratio 1933	Operating Ratio 1932
American Gas & Electric and subsidiaries					
(Year ended September 30)					
Gross earnings	$63,141,774	$66,770,235	− 5.4	60	57
Net balance	7,848,118	10,819,943	− 27.5	..	..
American Power & Light and subsidiaries					
(Year ended September 30)					
Gross earnings	73,098,396	78,242,394	− 6.5	56	53
Net balance*	5,533,953	10,750,329	− 48.6	..	..
Columbia Gas & Electric and subsidiaries					
(Year ended September 30)					
Gross earnings	76,941,925	83,794,887	− 8.2	67	64
Net balance	7,403,043	12,031,593	− 38.6	..	..
Commonwealth & Southern and subsidiaries					
(Year ended September 30)					
Gross earnings	109,362,674	118,504,378	− 7.7	55	53
Net balance	288,923	7,177,935	− 95.6	..	..
Electric Power & Light and subsidiaries					
(Year ended September 30)					
Gross earnings	68,723,868	75,048,157	− 8.4	63	58
Net balance*	390,684‡	6,160,502	−106.0	..	..
National Power & Light and subsidiaries					
(Year ended September 30)					
Gross earnings	74,247,947	78,842,655	− 5.8	60	60
Net balance*	7,430,516	9,111,210	− 18.4	..	..
North American and subsidiaries					
(Year ended September 30)					
Gross earnings	106,976,408	116,736,787	− 8.4	67	65
Net balance	11,110,784	17,172,218	− 35.4	..	..
United Gas Improvement and subsidiaries					
(Year ended September 30)					
Gross earnings	109,210,696	116,964,567	− 6.7	55	56
Net balance	29,688,638	32,180,388	− 7.8	..	..

*Before all dividends. †Includes non-operating revenue. ‡Deficit.

Gross earnings—(Operating Companies) Gross operating revenue (Holding Companies) Gross operating revenue plus other income. Net earnings—Earnings after deduction from gross earnings of operating expenses taken to include taxes, depreciation, maintenance, operating, etc. Net balance—Balance available from income for common stock dividends.

Weekly Output Marks Time



Output of central stations during the week of November 18, announced as 1,617,249,000 kw.-hr. by the Edison Electric Institute, was virtually the same as in the preceding week. The absence of a seasonal increase cut the margin over 1932 to 5.6 per cent and widened the deficiency compared with 1931 to 2.3 per cent.

Three major geographic divisions increased their lead over last year, New England by nearly 2 per cent, the West Central and Pacific areas by smaller amounts. Shrinkages in the Central and Middle Atlantic regions still left good margins over 1932, but the South continues to recede, production in this section having fallen, in seven weeks, from 15.8 per cent over to 3.9 per cent under 1932.

Weekly Output, Millions of Kw.-Hr.

1933	1932	1931
Nov. 18...1,617	Nov. 19...1,532	Nov. 21...1,655
Nov. 11...1,617	Nov. 12...1,521	Nov. 14...1,623
Nov. 4...1,583	Nov. 5...1,525	Nov. 7...1,628
Oct. 28...1,622	Oct. 29...1,533	Oct. 31...1,652
Oct. 21...1,619	Oct. 22...1,528	Oct. 24...1,647

Per Cent Change from Previous Year

	Week ended		
Region	Nov. 18	Nov. 11	Nov. 4
New England	+ 8.4	+ 6.6	+ 5.2
Middle Atlantic	+ 4.6	+ 5.1	+ 1.0
Central Industrial	+ 8.7	+ 9.9	+ 5.5
West Central	+ 1.9	+ 1.6	— 0.6
Southern States	— 3.9	— 1.0	+ 0.8
Rocky Mountain	+26.6	+30.6	+29.2
Pacific Coast	+ 3.0	+ 2.6	— 0.8
United States	+ 5.6	+ 6.3	+ 3.8

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Michigan Fight Still On

Unwilling to concede defeat in his fight against the Michigan Public Utilities Commission, Governor Comstock is planning to present the second special session of the Legislature, meeting in early 1934, with a scheme to combine the utilities commission with the Michigan Securities Commission. This would cut short the terms of the five utilities commissioners appointed by former Governor Brucker in 1931 to serve until 1935 and allow Governor Comstock to name successors. Several bills of similar intent failed variously during the regular session. The Governor is said to have the resignations of two members of the commission, effective when he desires, but has been unable to get the necessary third resignation to control the body.

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Codes for Municipals?

Pleading that the New Deal should be a square deal for all business without unjust discrimination and unfair practices, Kansas City Power & Light Company is utilizing full-page newspaper advertising to advocate bringing municipally owned public utilities under the NRA code. "Communities in business should accept the same responsibilities as private individuals in business," states the company.

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Municipal Items

PARAGOULD, ARK.—Application for a grant and loan from the Federal Public Works Administration for the financing of a municipal light and power plant and distribution has been increased from $165,000 to $175,000, so as to provide for increase in cost of materials and labor since original application was made.

MURPHYSBORO, ILL.—Voters have defeated, by a count of 1,998 to 1,838, a proposal that the city issue $390,000 of bonds for building a municipal electric light plant to compete with the Western United Gas & Electric Company.

CHESTER, ILL.—City Council contemplates calling an election at an early date on a $158,000 bond issue for a municipal light and power plant and distribution system. Application has already been made for a grant and loan from the Federal Public Works Administration.

CAPE GIRARDEAU, MO.—By a majority of approximately five to one voters last week defeated a proposal to grant the Missouri Utilities Company a franchise to operate light and water plants in this city. A similar proposal was defeated by a much smaller margin three years ago. The company has continued to serve Cape Girardeau since expiration of its franchise several years ago. Petitions have been circulated and soon will be presented to the City Council asking that body to submit a proposal for a municipally owned electric light plant to the voters.

TRENTON, MO.—Voters at the election held November 14 approved, 1,989 to 861, a proposal to issue bonds for construction of a municipal electric light plant. The margin exceeded by 90 the required two-thirds. In April a similar vote on the proposal resulted in defeat.

ST. PAUL, NEB., is talking over the electric distribution system of the Central Power Company through condemnation proceedings.

NEBRASKA—Backers of the Sutherland combination power and irrigation district have attacked before the Nebraska state Board of Irrigation the right of the Tri-County project to priority of water rights in the Platte River, charging non-users for a period of years sufficient to justify an order of dismissal, and that the Tri-County project is speculative, remote and impossible. Further delay would prevent work being begun during 1933 on the Sutherland project, which now has a $7,500,000 government loan and grant. Attorneys for the Sutherland project say that if the Tri-County applications are not held to be void no public works funds will be spent in Nebraska. Meanwhile the Tri-County, which has its loan application pending before the state Public Works Advisory Board, has revised its plans to include a larger area, and Clark E. Mickey, University of Nebraska professor, now in charge, has recommended an increase of requested loan and grant from $36,000,000 to $42,000,000. Attorneys for the two Loup River projects have also filed objections to granting water rights to the Columbus-Genoa project, citing the constitutional provision that in determining priority of water rights domestic use should be given first consideration, agriculture next and manufacturing last. Governor Bryan has ordered state engineers to ascertain the truth of the charge that there is not enough water for all three developments.

Senator Norris is urging municipalities to take advantage of the generous attitude of the national administration and borrow for municipal construction and operation. On November 11 the

New York Metal Prices

	Nov. 14, 1933 Cents per Pound	Nov. 21, 1933 Cents per Pound
Copper, electrolytic	8.25	8.25
Lead, Am. S. & R. price	4.30	4.30
Antimony	7.20	7.25
Nickel ingot	35.00	35.00
Zinc, spot	4.85	4.87
Tin, Straits	53.90	55.00
Aluminum, 99 per cent.	23.30	23.30

eighth public power and irrigation district in Nebraska applied for a state charter. It is the Imperial Valley district and asks to be allowed to draw water from the Frenchman and Stinking Water rivers and Red Willow creek.

Federal Public Works Administration has approved a grant and loan of approximately $7,300,000 under the national recovery act for the contemplated hydro-electric project on the Loup River in Nebraska. A company formed by local business interests is sponsoring the project. The plans contemplate a hydro-electric dam on The Loup River near Genoa, from which the water would be diverted to the power site just north of Columbus. It is anticipated the project will develop 20,000 kw. of energy and furnish electric power to towns within a radius of 100 miles, including possibly Council Bluffs and Sioux City, Iowa, and Lincoln and Omaha, Neb. There would also be about 20 miles of canals starting about 3 miles north of Columbus.

CAMDEN, N. J. — Construction of a municipal light plant, ordered by a referendum vote at the election early this month, has been stayed for at least six months by a writ of certiorari issued by Supreme Court Justice Frank T. Lloyd. This action was sought by several individuals and corporations, including the Public Service Electric & Gas Company; Clinton L. Bardo, president of the New York Shipbuilding Company, Camden; former State Treasurer William T. Read, and others. In the meantime the city made formal application for a federal grant of $2,250,000 and a loan of $5,250,000. The Supreme Court did not retrain the loan application.

BAYONNE, N. J.—Encouraged by the action of the citizens of Camden in voting favorably on a municipally owned power plant, the Bayonne Non-Partisan Unemployed League last week launched a movement for the purpose of having the City Commission take similar action.

BURLINGTON, VT. — Allotment has been made of $3,600 to aid in installation of underground electric wiring and an ornamental system of lighting. No loan was requested.

TARRYTOWN, N. Y.—Board of Water Supply has made request of the Reconstruction Finance Corporation for a loan of $150,000 to erect a municipal power plant. The commissioners have a profit of $50,000 from the sale of water for the last five years, which also will be used if the loan is granted.

JAMESTOWN, N. D.—Citizens have voted more than two to one in favor of construction of an electric power and light plant. There were 1,647 votes cast in favor and 723 against. The city will ask the Reconstruction Finance Corporation for a loan of $600,000 to construct the plant.

FAIRFAX, OKLA.—State Department of Waterways, Power and Flood Control has under advisement the application of citizens for approval of a proposed $3,000,000 hydro-electric power project for Oxbow Bend on the Arkansas River near Kaw City and Fairfax in Osage County.

FORT WORTH, TEX.—Revised program for the construction of a number of municipal projects here calls for a total expenditure of approximately $9,800,000. Most important of the proposals is that for a municipal electric light and power plant, the estimated cost of which is $4,000,000. Preparatory steps for obtaining a loan for the construction of the proposed plant have been taken.

HARRISBURG, ILL.—In a recent election the city defeated municipal ownership by two to one. Belvidere likewise rejected it.

CHANUTE, KAN. — Federal Public Works Administration has granted a $25,000 loan to be expended on an addition to the municipal light and power plant.

CENTRALIA, MO.—Application will be made to the Public Works Administration for a $60,000 loan to make extensions to the lighting system, which has been municipally owned for almost twenty years. Power is purchased from the Missouri Power & Light Company.

CORINTH, MISS.—Board of Aldermen voted last week to open negotiations with the Mississippi Power Company for the purchase of the company's plant. Another resolution was passed setting out the city's intention of acquiring a distribution system by other means, if the negotiations to buy the local plant fell through. It was also voted to make formal application to the T.V.A. for power and a copy of the resolution was ordered forwarded to Dr. Arthur E. Morgan.

ST. LOUIS, MO.—Net saving of $4,314 a year could be effected by the city operating its own electric plant to furnish current for downtown street lighting and illumination of the plaza group of public buildings, Ralf Toensfeldt, chief electrical engineer for the city, has reported to Director of Public Utilities Wall. The survey was made by Mr. Toensfeldt at the request of the Mayor, who desired to know if the city could furnish its own electricity cheaper than it could be bought from the Union Electric Light & Power Company.

TYRONE, PA., at the election early this month, voted to retain private plant service.

Major New Construction This Week

Monongahela-West Penn Public Service Company plans transmission line from New Cumberland to Pughtown, W. Va., for service to latter place.

Office of Indian Affairs, Department of Interior, Washington, D. C., plans transmission lines, power substations, electric pumping plants and booster stations for irrigation system on Gila River Indian Reservation, Florence-Casa Grande Valley, Ariz. Fund of $688,000 approved for immediate work. Total project will cost $1,650,000.

Georgia Power Company plans transmission line from Atlanta to Fort Benning, Ga.

Crescent Brewing Company, Joplin, Mo., plans a $100,000 development.

Ontario Hydro-Electric System plans transmission line from hydro plant in Abitibi Canyon to gold mining district at Matechewan, with power substation and distribution facilities.

Electric hoists, conveyors, motors, etc., will be installed at new all-steel tipple at Chickasaw mine of Allegheny River Mining Company, Kittanning, Pa. Cost $85,000.

Until December 5, Dover, Ohio, asks bids for extensions to city-owned electric light and power plant. Appropriation of $105,000 approved.

Motors, controls, hoists, pumps, etc., will be installed in dirigible hangar and shops of Virginia Airship Company, Inc., Richmond. Cost over $300,000.

Niagara, Lockport & Ontario Power Company will construct 33,000-volt transmission line from Evans, N. Y., to connect with present Buffalo-Olean high-tension system, near Cascade Park, including new power substation at Concord, N. Y.

Ely, Minn., plans city-owned electric light and power plant. Financing for $1,700,000 being arranged.

Until December 15, Bureau of Reclamation, Denver, Colo., asks bids for ten 23,000-volt and two 15,000-volt vertical lift-type or removable truck-type oil circuit breakers, with complete accessories, for Boulder power plant (Specification 553).

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Glenville to West Penn

Glenville (W. Va.) Electric Company, for years operated as a subsidiary of the Virginia Public Service Company, has been taken over and will hereafter be operated by a subsidiary of the West Penn Electric Company. Existing West Penn high-tension lines come within 7 miles of Glenville. The Grantsville generating station on the Little Kanawha River is but 22 miles from Glenville.

As to Rates——

• Washington Water Power, Puget Sound Power & Light and Pacific Power & Light companies, whose 1933 eastern Washington irrigation power and spray rates were slashed recently by the state Department of Public Works (ELECTRICAL WORLD, August 19, page 233), have emerged victorious in a court battle to overturn the department's decisions. Ruling on review proceedings instituted by these companies, Judge John M. Wilson of the Thurston County Superior Court reversed the department's orders. The reversals were based on the grounds that the department followed an erroneous theory as to the law, and that it arrived at conclusions not supported by the law or the facts. The court also held the department cannot order emergency reductions in utility rates without first determining a fair valuation rate base for a utility. In the irrigation power rate case the department proceeded without making a valuation survey of any company and ordered each company to reduce its irrigation power rates approximately 35 per cent. Department officials indicated they will appeal to the state Supreme Court.

Valuations of the Puget Sound company properties by the state of Washington, the largest valuation proceedings ever undertaken by the state, is being started at once by J. W. Carey, chief engineer of the Department of Public Works. Similar valuations are also being started with the Washington Water Power Company at Spokane and the Pacific Power & Light Company, with book valuations of upward of $200,000,000. Mr. Carey states that "no valuation by the state has ever been made of the Puget Sound Power & Light Company, but its vice-president, S. P. McFadden, tells me the firm anticipated the move and has had a crew of engineers in the field for some months. We have been promised that we will start getting their inventories in two weeks, and we should have them complete in two months." The state has had power to control rates of private power companies for more than twenty years. Properties of the Washington Water Power and the Pacific Power & Light companies have been valued, but Carey declares the department will largely disregard past history. Under the new law passed by the last Legislature the power companies will meet the cost of the state valuation, as well as paying for their own engineers.

• Alabama Power Company's rate schedule formulated in accordance with an order of the state Public Service Commission (ELECTRICAL WORLD, September 9, page 325) has been revised by a commission amendment to "correct instances where residential consumers had received rate increases." The commission estimated that the amendment would result in an additional saving of $31,000 to urban residential consumers and $8,300 to rural consumers, bringing the total estimated savings under the original order and the amendment to approximately $400,000.

• Detroit Edison Company's net earnings have dropped 50 per cent since 1929 and dividends to stockholders have been reduced similarly, according to a statement by A. C. Marshall, vice-president and general manager, in response to a demand of City Council for an inquiry into earnings of the company. The demand from a member of Council included the desire to "interpret earnings in terms of the company's investment." The Council was told by corporation counsel that this would not be possible without the appraisal which the city had been trying to have made by the utilities commission.

• Public Service Company of Northern Illinois' rate case was resumed last week before the Illinois Commerce Commission with the cross-examination by company counsel of Mark Wolff, witness for the commission. Under direct examination state witnesses had indicated previously that a 6 per cent return could be considered reasonable for the company at the present time, a figure challenged by the company and defended by Mr. Wolff on the basis of the federal district court's findings of a 5½ per cent return reasonable in the Chicago telephone case. Company counsel elicited the statement that capital costs and refinancing problems of the company were given weight in finding a reasonable rate of return. Company representatives had stated that the company's latest financing had cost in excess of 8.5 per cent and the company was faced with refunding operations totaling more than $30,000,000 by 1937.

• Staten Island Edison Company's rate reduction case before the New York Public Service Commission was adjourned last week to permit the chairman of the commission, Milo R. Maltbie, sufficient time to examine the exhibits. The hearing into the rates charged by the Bronx Gas & Electric Company, which was scheduled before Commissioner George R. Van Namee, also was adjourned.

• Utah Power & Light Company was charged with inflation of capital account by representatives of the United States Army seeking a 10 per cent reduction in electric rates. The schedules at Fort Douglas, the Ogden arsenal, the army hangar at the Salt Lake airport and a residence on Alta street are involved. Since a large proportion of the customers of the company are supplied under the same schedule, the public generally may benefit by any overcharge that may be found to exist affecting the army as a power customer. It was the argument of Colonel Smith, judge advocate-general of the Ninth Corps Area, U. S. Army, that in a time of depression, when hardly any business is making any profit and most are showing losses, a utility should not contend that it is entitled to the same rate on its investment valuation as it would receive in better times. G. R. Corey, counsel for the company, in replying to Colonel Smith's statement, pointed out increased uncontrollable costs, such as taxes, both state and federal, lowered gross revenues, and lowered rates for service.

• Tennessee Electric Power Company's rates will be investigated if the Chattanooga City Commission acts on the request made recently by the Citizens' Council to begin immediate negotiations with the company. The council asked the city to employ a competent rate expert for this purpose. The schedules of industrial and commercial rates announced by the Tennessee Valley Authority appear to be considerably under the rates charged by the company, according to a statement made by Malcolm Williams, engineer for the Tennessee Railway and Public Utilities Commission. He said he could not give a percentage, since this would require considerable figuring and would vary in the case of the different customers. He explained that this is true, since the rates quoted by the T.V.A. give no demand charge or loan factor requirements. The Tennessee Power company rates to these two classes of customers carry a demand charge.

• Pacific Gas & Electric Company's executive salaries were freely discussed in an order of the California Railroad Commission, reducing that company's gas rates on an average of 11.2 per cent. Assailing the present salaries and ordering a 40 per cent reduction in the amount of such salaries chargeable to operating expense, the decision states:

"These salaries have been maintained until the latter part of this period of depression, when they suffered a discount of 10 per cent. Before this the lower brackets of salaries and wages had been substantially reduced. Company counsel pleaded that salaries of management should not be assailed, that the executive officers had done excellent work and the amount of their salaries could have no appreciable effect upon rates. While the management has been generally effective under normal and prosperous conditions, we cannot say that it has risen to the occasion in this time of stress. When the depression was surely upon us, we believe the company should have reduced operating expenses to the minimum compatible with proper service, should have reduced dividends to correspond more

nearly with earnings in other legitimate businesses, having in mind only the safety of future financing, and with the savings thus made should have builded better public relations by voluntarily giving part of those savings to consumers who severely felt the depression, and a portion to the reserves of the company for the security of service. . . Whatever mild admonitions herein are addressed to management primarily should find resting place with the board of directors of this company, which is representative of the larger ownership interests and is clothed with the final power to determine policies."

• Litchfield (Conn.) Electric Light & Power Company has made a rate reduction on power charges in Litchfield, Bantam, Bethlehem, Ridgefield, Morris, Goshen, Roxbury, New Fairfield and Washington. The lighting rate, which does not include a charge based on area, is reduced from 16 to 14 cents per kilowatt-hour for the first 50 kw.-hr. per month. The next 200 kw.-hr. sold is 12 cents, the next 250 at the rate of 10 cents and all over 500 kw.-hr. at the rate of 5 cents.

• Texas Electric Service Company has been denied by the United States Supreme Court a review in a dispute with the city of Seymour, Tex., over an ordinance fixing minimum rates which may be charged for electricity. The city runs a plant in competition with the service company, and after the service company reduced rates below those of the city's plant the ordinance was executed, increasing the company's rates to the level of those of the city plant. Maximum rates were left to the discretion of both the municipal and service company plants.

• Missouri Public Service Company, serving electric power to 82 cities and towns in that state, has filed a schedule of reduced rates with the Public Service Commission. Under the new schedule the top rate would be reduced approximately 16⅔ per cent and a saving of $50,000 to customers would result.

• Clinton Gas Light Company's electric rates will "stay put" at present, the Massachusetts Department of Public Utilities having noted a progressive falling off in net income while the customers have received a slight measure of relief in the transfer of the 3 per cent revenue tax to the company. The possibility of some increases in expenses due to compliance with the NRA is mentioned and the decision points out that the company's uncollectibles are troublesome and may amount to approximately the total net corporate income this year. Little weight is given to the fact that the company has made but one reduction in rates since 1929, the board pointing out that during the period of high prices the company made several rate reductions.

• Scranton (Pa.) Electric Company's reduction in rates, effected through informal conferences between officials and the Public Service Commission, will save consumers in Scranton and vicinity $298,696 annually, the commission has announced. The rates were reduced from 8 to 7 cents per kilowatt-hour for customers using up to 30 kw.-hr. monthly. The customer charge of $1 now applicable to 29,000 accounts was abolished and substantial reductions were provided for customers using from 30 to 50 kw.-hr. monthly. The delayed payment charge was reduced from 5 to 3 per cent.

• Northern Indiana Public Service Company's offer of lower electric rates in Valparaiso has been rejected by the City Council on the ground that the small consumer would not benefit. Council plans to obtain data on the cost of building a municipal light plant.

• Senator Pedersen of Nebraska, author of the bill passed last winter prohibiting power companies from making a service charge, has invoked, with sixteen neighboring farmers, the powers of the state Railway Commission to prevent this prohibited charge being absorbed in rates. The Southern Nebraska Power Company has been charging farmers 7 cents per kilowatt-hour for the first 50 kw.-hr. and 4 cents thereafter, with a $3 a month service charge. The Senator charges that the company refuses to renew contracts unless consumers agree to pay 35 cents for the first 12 kw.-hr. and 4 cents thereafter, the effect being to collect slightly more than the eliminated service charge. The railway commission, while not clothed with power to make electric rates, is named as arbiter by a statute covering farm service, to act when parties to a contract cannot agree.

• Wisconsin Power & Light Company, in a letter to stockholders, has announced that it will give a trial to new rates ordered by the Wisconsin Public Service Commission before attempting any contest of them in court. The $300,000 reduction ordered on the basis of 1932 current consumption cannot be afforded by the company unless the lower rates lead to increased load, as the commission anticipates, Grover C. Neff, president of the company, stated. Contesting the commission order might result in high court costs and cause ill will between customers and company, Mr. Neff pointed out. "Residential electric rates of the company appear to be higher than they really are. Apparently these rates are unpopular with the company's customers, as 62 formal complaints from cities, villages and customer groups were filed with the Public Service Commission during the past two years. Furthermore, about ten communities voted last spring to buy and operate municipal plants. The new proposed rates are easy to understand, produce uniform bills to all customers in any community using the same amount of electricity and are much lower. It would seem that the establishment of these new low rates should satisfy the company's customers, stop rate hearings and slow up municipal ownership activity. This would be of considerable value to the company."

• Quebec Power Company has offered the city of Quebec a reduction in electricity rates for street lighting and domestic purposes following negotiations which have extended over a period of several months. An offer made in 1931 contained a $350,000 reduction a year, but as the revenues of the company have since declined $200,000, the company now offers a reduction equivalent to $150,000 on domestic service rates. In addition to the $150,000 reduction in rates on electricity for domestic purposes the company offers a reduction of $35,000 in the cost of electricity for street lighting. In return the company asks the city to enter into a new ten-year contract from July, 1935. The city's administration committee is studying the offer.

• Cincinnati Gas & Electric Company and the Union Gas & Electric Company have appealed to the state utilities commission from a Cincinnati ordinance fixing electric rates in the city of Cincinnati for an unspecified time. The companies asked to collect the present rate under bond while the appeal is pending. The commission approved a bond of $3,000,000 filed by the company to guarantee any excess that might be collected. It was signed by the Columbia Gas & Electric Corporation, parent company of the two Cincinnati companies. The commission, in approving the bond, reserved the right to require additional bond or additional security.

• Virginia Electric & Power Company's electric rates should be substantially reduced in Richmond and other cities, in the opinion of Dr. John Bauer, executive director of the American Public Utilities Bureau, who maintains that the rate base for the electric department of the company is 50 per cent too high.

• Iowa-Nebraska Light & Power Company's dispute with the City Council of York, Neb., concerning gas and electric rates, was recently settled when the federal court dismissed the case, a compromise having been reached. The company will eliminate the 50-cent-a-month service charge and be permitted to charge a schedule of rates materially higher than that which the Council established by ordinance, the effect on residential revenue being a reduction of $2,000 for the year. The city will save materially on street lighting contracts.

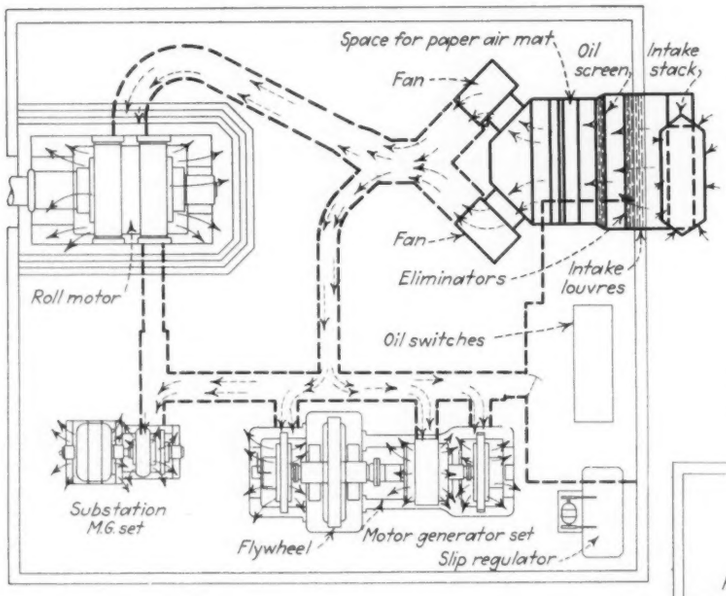
Conditioning Air for Steel Mill Motors

IN STEEL MILL motor rooms, where there are frequently very large concentrations of capacity in motors and conversion equipment in very small spaces, ultimate temperatures may be encountered that will rapidly deteriorate winding insulations unless means are employed to carry off waste heat. Heat from electrical losses in steel mill drives is something to be taken into account. An efficiency of 80 per cent is reasonable. This means that with a 10,000-kw. input 2,000 kw. is released in heat, nearly 120,000 B.t.u. per minute. Also, the presence of acid fumes, soot, scale, etc., makes necessary a supply of clean air to the electrical machines to prevent commutation troubles and insulation failures.

In the development of air-conditioning practice in the motor rooms of the South Works of the Illinois Steel Company four distinct stages are observable. Undoubtedly the liberality with iron and copper displayed by the early designers of mill motors held off the necessity for air conditioning for many years. But as steel output increased and motors were pushed high above their ratings it became apparent that something would have to be done. An example of what usually was done is furnished by the record of the installation of a home-made washer consisting of a fan blowing air through water-soaked cheesecloth in the 30-in. universal plate mill at the South Works. The 4,000-hp., 600-volt reversing motor with its flywheel motor-generator set in this mill had been installed in 1907 and for years had carried its load without any help in heat dissipation.

The second phase marks the recognition of air conditioning as a factor in the design of mill-drive installations. Practice in this period was to draw outside air into the motor rooms through water spray washers. Steam-heated coils were employed to temper the entering air to prevent freezing of the water sprays during cold weather. As shown in the tabulated data, a number of such installations were made at the South Works. These installations had their troubles. Spray nozzles became clogged with the dirty mill cooling water available. This difficulty was overcome by the use of a rapidly revolving conical spray head against whose apex a stream of water was directed. But this was not all. It was found that the water spray was reasonably effective in removing large particles of dirt from the air, but did not perform so well in arresting fine dust, particularly soot. Some improvement was made in later installations by provision for recirculation of air in the winter. Recirculation also allowed reduction of steam consumption for preheating intake air.

The year 1928 saw the third stage with an entirely different method of air conditioning in the new mills of the South Works, dry cleaning instead of wet. In-

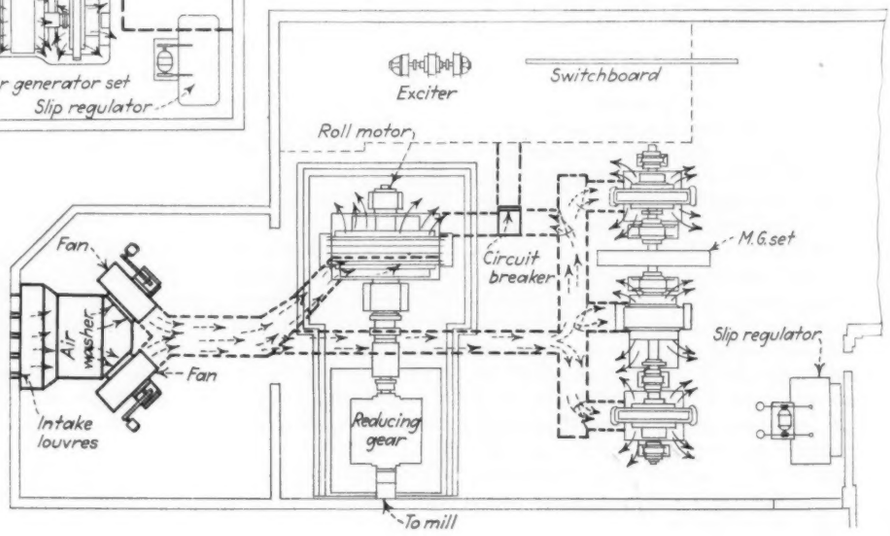


The next step—oil screens

About as effective as the air washer in removing dirt from the air, the oil screen included no cooling capacity. This allowed of air recirculation only during the cold weather.

Early method of motor room air conditioning

All air drawn in from outside, passed through dust eliminators and spray chamber.

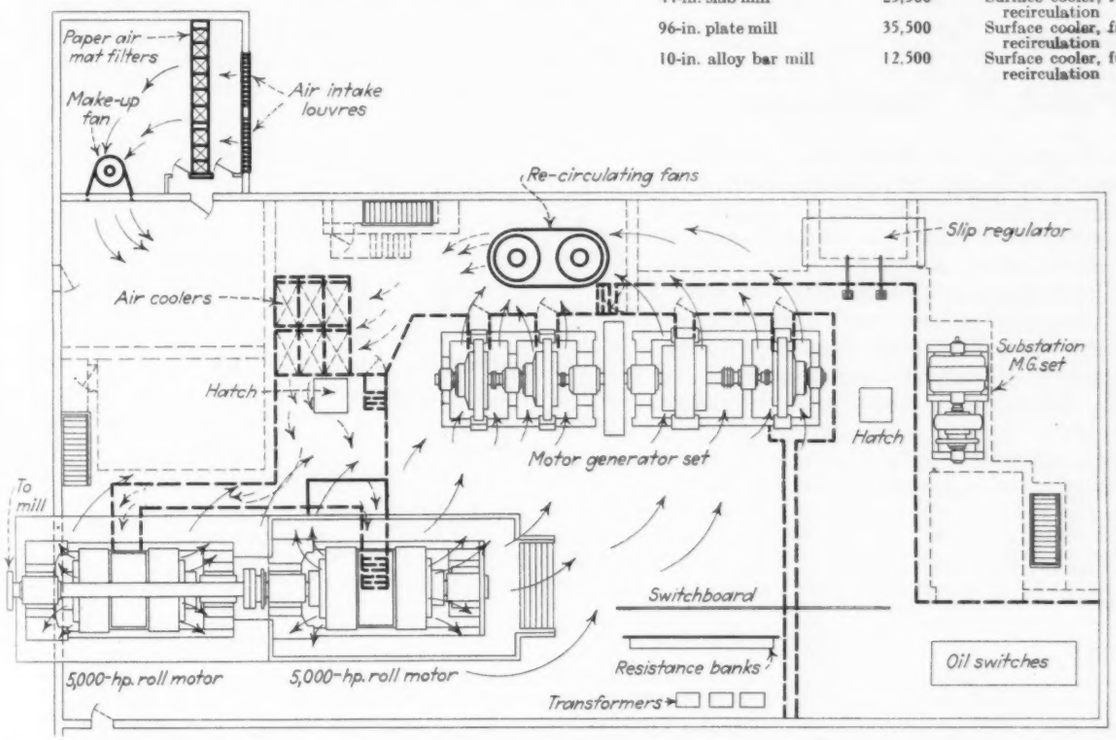


coming air is passed through oil-covered screens and then through filter paper air mats. However, these mats became clogged very quickly and thus were expensive to maintain. A later developed method of installing the mats would undoubtedly have decreased the maintenance cost, but the necessary changes could not be made because of lack of space. Therefore the mats were removed and dependence placed on the oil screens, which are about as effective for cleaning as the water spray. Partial recirculation is employed in this installation.

The last phase followed the realization that no one of the existing methods of air conditioning would meet the requirements of a large new mill built in the South

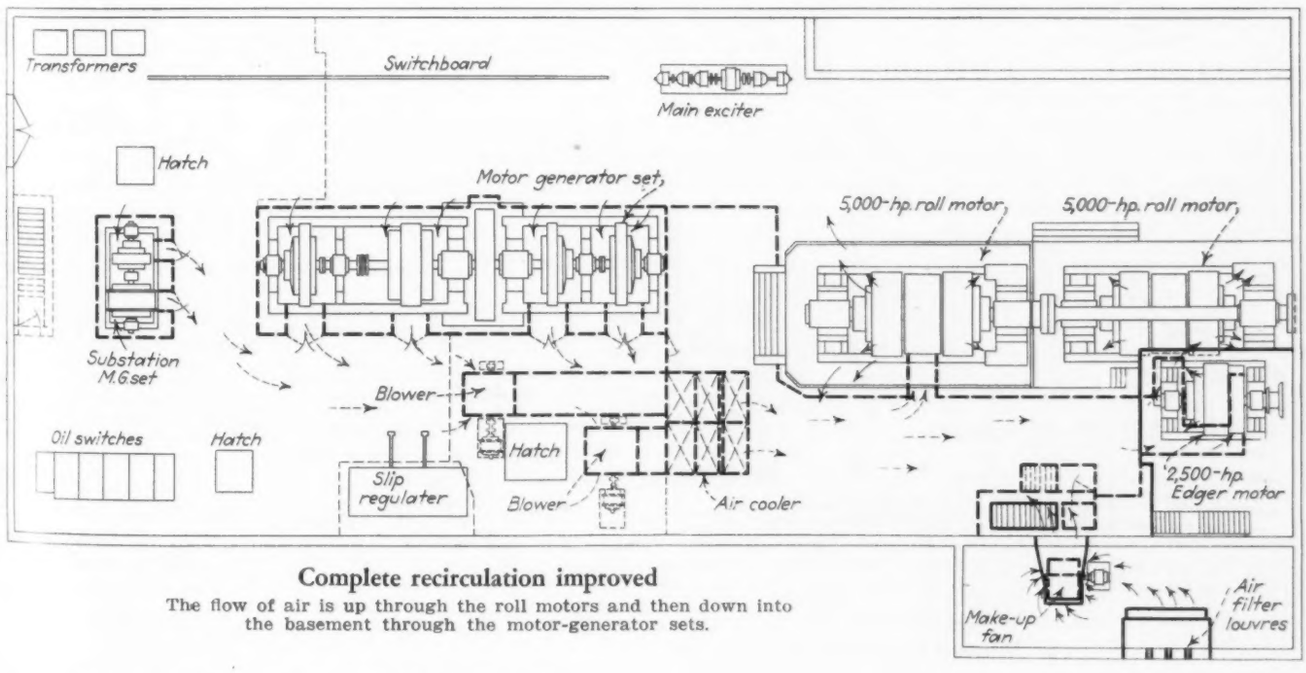
Air-Conditioning Development at South Works of Illinois Steel Company

Installation	Capacity of Machines Served, Kw.	Type of Air Conditioning	Fan Motor Capacity, Hp.
30-in. universal plate mill	9,000	Water spray nozzles, no air recirculation	30
90- and 132-in. sheared plate mills	10,000	Water spray rotating heads, no air recirculation	20
No. 2, 40-in. blooming mill	15,300	Water spray, rotating heads, no air recirculation	..
12- and 16-in. alloy bar mills	12,350	Water spray, rotating heads, no air recirculation	45
35-in. blooming mill	14,625	Water spray, rotating heads, partial recirculation	150
No. 1, 40-in. blooming mill	16,000	Oil screen, partial air recirculation	150
28- and 32-in. structural mill	21,750	Oil screens, partial air recirculation	250
54-in. blooming mill	22,875	Surface cooler, full air recirculation	150
52-in. structural mill	55,000	Surface cooler, full air recirculation	225
44-in. slab mill	25,500	Surface cooler, full air recirculation	300
96-in. plate mill	35,500	Surface cooler, full air recirculation	300
10-in. alloy bar mill	12,500	Surface cooler, full air recirculation	120



Complete air recirculation

Reuse of motor room air, with only enough intake from outside to maintain positive pressure in the room, permits the use of surface type air coolers instead of water sprays. Note the motor-generator set cooled by air drawn over it.



Complete recirculation improved

The flow of air is up through the roll motors and then down into the basement through the motor-generator sets.

Works in 1930. It was decided to carry out completely the idea of air recirculation. By employing a make-up fan of relatively small capacity, delivering air through a reasonably good filter, very little dirt is introduced into the motor room. Furthermore, the make-up fan maintains a positive pressure in the motor room and all leakage is outward, preventing the infiltration of mill dirt. Also, since the water spray was no longer needed to clean, as well as to cool, the air, surface type coolers could be used to remove the heat. Four installations of this type have since been made at the South Works and each has proved itself to be a system requiring little maintenance and very effective in keeping mill dirt out of the motor rooms.

▼

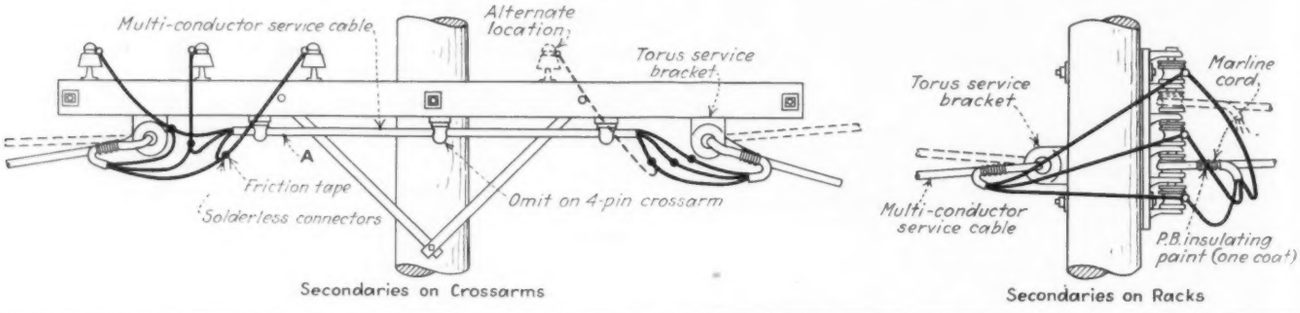
Service Pull-Off Standards

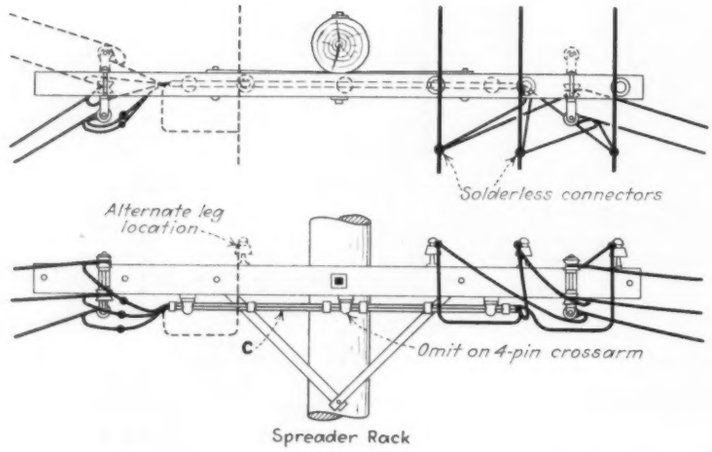
On the New England Power Association system service pull-offs have been established for distribution circuits to unify designs, simplify the ordering of material and facilitate construction. Multiple-conductor cable is used widely to minimize the space occupied in carrying wires from one side of the pole to the other and also in many services from the secondaries. Obstruction to climbing is thus largely eliminated, even in situations where customers must be served from one set of secondary mains by drops carried away from the pole in opposite directions. Torus service brackets screwed into the wooden crossarm are used in simplifying pull-offs with multiple-conductor cable (Fig. 1). On open-wire construction spreader racks and spreader brackets are employed extensively (Fig. 2).

Fig. 1—Service pull-off with multiple-conductor cable from secondaries on crossarms and racks

A—When secondaries and services are on the same side of pole omit crossover cable and screw insulators.

B—Two three-conductor No. 6 cables per torus bracket and one cable per spool insulator may be installed. Use additional torus brackets and double arm when necessary.





A—Three No. 6 services may be installed per spreader rack; two No. 6 services per spreader bracket.

B—Install extension spreader rack (dotted) or an additional spreader bracket when service pull-off cannot otherwise be properly made.

C—Use rubber-covered wires taped together at 12-in. intervals or multi-conductor cable for crossover under arm. When secondaries and services are on the same side of the pole omit crossover wires, screw insulators and one "pull-off" unit.

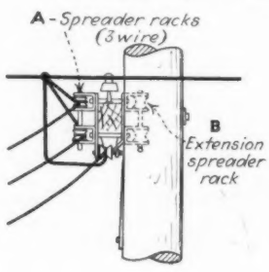


Fig. 2—Service pull-off from crossarms with open wire drops, using spreader racks

Colored Ball Knobs Show System Assignment of Generating Units

Red and blue are the designations of the two parts into which the system of the Commonwealth Edison Company, Chicago, is divided for operating purposes. For some years this division has existed as applying to lines and substation buses, but only lately has it been extended to include generating station units. It would be impracticable and it is unnecessary for the turbo-generators in a station to be assigned permanently to either one or the other of the two system parts and a machine may at one time be supplying the blue system and at another the red. Obviously it is desirable for the operators of the station switchboards to have some constant reminder as to which machines are on which systems and not have to depend on their memories or to consult the log when the need for such knowledge arises.

The condition is cared for in the Crawford Avenue station in a manner effective and at the same time refreshingly colorful in relief against the dark tone of switchboard panels. At the top center of the bench-board panels of the machines are drilled small holes about the size of a nail. Into the hole of the particular panel is inserted the pin of a red or blue ball knob of painted wood like an oversize map tack which shows at a glance on which system the unit is operating.

T.V.A. Seen Only as Spur to Electrification of America

By DAVID E. LILIENTHAL*
Director and General Counsel, Tennessee Valley Authority

THE Tennessee Valley Authority act marks the beginning of a new national power policy and national power program. This new national policy has two major objectives. The first objective is more effective protection of the public interest, by the setting up of a measure of public operation of power as a "yardstick." The second objective of this new national policy is a greatly increased use of electricity in the homes, the farm and the factories of the United States—an electrified America.

The President and the Congress have set themselves to the task of putting to work the vast sources of electricity which lie idle and unused. We are working toward no less a goal than the electrification of America. The plans have been laid. Legal authority is ample. The economic difficulties can be overcome. The project is practical and feasible. The program can be carried out. Within the next decade it lies within the power of the people of the United States to make electricity in very truth the servant of the average man and woman in the homes, farms and places of business of this country.

The power program of the authority is a crucial part of its plans for immediate action and of the long-range program for the development of this region. This power program is of particular interest not only within the valley, but it has and is intended to have a national significance. For the problems which center about the power question here in the southeastern region of the United States are questions not peculiar to this area, but which are common to the country as a whole.

Our second greatest resource

The national power policy of the President and the Congress written into the Tennessee Valley Authority act recognizes that electric power, next to the soil, is our greatest resource. It recognizes that the people must maintain public control of this liberating force. This is the first objective of the national power policy to which I have referred.

Regulation by commissions had in many states proved ineffectual. In some states it was perfectly obvious that the regulators were not regulating the utilities, but, in effect, the utilities were regulating the regulators. In other states the regulatory commissions were doing an honest and sincere job, but were hampered by the interminable procedure of regulation, with rate cases sometimes dragging through a decade. And so, to supplement regulation by commissions, Congress passed the Tennessee Valley Authority act. This act is not an assault upon private ownership and management of public utilities. But it is a determined attack on private mismanagement of the public business of power at the expense of the people back home—consumers and investors alike.

No measure sponsored by the President has behind it so determined a body of public opinion as supports the power program of the Tennessee Valley Authority. The sooner the public utility industry realizes this fact the sooner we will all be ready to deal with the more constructive features of the new national power program.

It was with such a background that Congress passed the Tennessee Valley Authority act and set up a measure of public operation of the power business. This public operation is to serve as a yardstick by which to measure the fairness of electric rates. It has an additional function. It is a reminder that electricity performs a public service. It is a reminder that unless that business is conducted by private corporations with fairness, without financial jugglery and with a due sense of responsibility to the paramount public interest the public at any time may itself assume the function of providing itself with this necessity of community life.

T. V. A. must have balanced load area

What the Tennessee Valley Authority is required to do in its power program is to set up an area for power operations. That area is to be on a comparable basis with typical private operations. To set up such a "yardstick" the authority obviously must undertake to serve an area which is large enough and sufficiently concentrated and with an adequately diversified industrial, commercial and residential load to provide a fair test. As business men, it is apparent to you that if the authority is to serve only the parts of a territory which a private utility has not chosen to serve, or is to serve only sparsely populated areas, the result of our operations cannot possibly be set up as a measuring rod. The authority will necessarily have to undertake to serve a balanced area, including some cities of substantial size, good farm territory and reasonably favorable distribution possibilities.

This power program is a constructive measure. Congress has not declared a national policy against the private ownership and operation of public utilities. It has rather provided for an additional measure of public protection against abuses in the conduct of a business which, by its very nature, is a matter of fundamental public concern.

Second objective of equal significance

The power program of Congress and the President has as its major objective a constantly wider use of electricity. The goal of this national power policy is a constructive one; *it is nothing less than the electrification of the homes and farms of the United States.* It is for the

*Essentially the whole of an address, "A Five-point Program for the Electrification of America," before the Lawyers' Club, Atlanta, Ga.

authority to lead the way through the tangle of engineering obstacles and of economic difficulties which obstruct the path to a genuinely widespread use of this great resource of electricity. I know something of the difficulties which lie ahead. This is not an academic exercise; it is not going to be a Sunday school picnic. We have been advised on the business problems which have to be surmounted. We know something of the engineering difficulties; of the problems of rising costs of transmission; of the problems of water control; of the difficulties of unfavorable peak loads. There is a serious problem of changing our customs of doing things. But in spite of all the difficulties, I am convinced that this objective of an electrified America is no mere Utopian dream. It can aid in the program of re-employment and national recovery toward which slowly but surely the American people, under the leadership of President Roosevelt, are moving.

Imperative to stimulate usage

The electric industry, both privately and publicly owned, is running into a financial blind alley unless the use of electricity can be very substantially increased within the next three years. The plain fact is that the use of electricity has fallen behind the installation of power-generating facilities. This is true, almost without exception, throughout the country.

The fundamental problem of the Tennessee Valley Authority, of the electric industry, of the federal government is to devise economic ways and means to make electricity generally available, of promoting the widest possible use of power in the home, on the farm and in the factory. At the present time the average monthly use of electricity for domestic purposes in this country is about 50 kw.-hr. That figure is a challenge to the electric industry and to the people of the country. It represents a parsimonious and niggardly use of a great national resource. We know that the figure of 50 kw.-hr. a month can be increased several times, for in some sections of our country and in our neighbor country of Canada that very thing has been accomplished. In Tacoma, Wash., for example, the monthly average domestic use is 104 kw.-hr. In the province of Ontario the average monthly use is in excess of 150 kw.-hr.

Increasing margin of capacity must be absorbed

Looking at the country as a whole, without respect to public operation or private operation, it is perfectly evident that we now have and soon will have a tremendous surplus supply of electricity. Within the area of the Tennessee Valley, for example, privately owned electric companies have generating and transmission facilities which can care for between 30 and 40 per cent more demands for electricity than is now required, even allowing for reasonable spare capacity. A fair estimate is that 25 per cent of the investment in power houses and transmission lines is idle and is piling up fixed charges, because the customers of these companies are still tied to a low average use of electricity.

The Tennessee Valley Authority has a hydro-electric plant at Muscle Shoals with a rated installed capacity of 250,000 hp. But that is only the beginning of the story. The authority is constructing a dam and power house at Cove Creek and another dam and power house above Muscle Shoals at what is known as the "Joe Wheeler" dam, which together will increase the capacity of Wilson Dam to at least 600,000 hp. Out in Colorado Boulder Dam is rapidly being carried toward completion at a total cost of $165,000,000. Boulder Dam on completion in 1937 will add to the nation's annual supply of electrical energy 4,330,000,000 kw.-hr. At Grand Coulee on the Columbia River and at Bonneville in Oregon are two giant power developments which are under way, estimated to cost another $100,000,000. The State of New York and the Dominion of Canada are making plans for a giant power development on the St. Lawrence River with an installed capacity of 2,200,000 hp.

These figures present the crux of the power problem in the United States today. It is evident that we have electricity in almost unlimited abundance. The people need and want this electricity. The problem is how to put this electricity into the homes, the farms and the factories of the United States. In the solution of this problem all of us have a common interest. The leaders of the electric utilities, as business men with a responsibility to their stockholders and to the consumers, are greatly concerned. Clearly the consumers and the industrialists are vitally interested. The manufacturers of electric equipment are immediately affected.

Lilienthal presents a five-point program

Breaking through the ring of difficulties, harnessing this electricity for the benefit of the people of the country is a task which calls for the co-operation of industry and government. I submit for consideration my conception of the underlying principles which should govern the labors of the Tennessee Valley Authority, and all the other agencies whose co-operation is needed in accomplishing the electrification of America, in a five-point program:

1. We must begin thinking in terms of an electrified America, and cast aside the tradition which is binding us to our present niggardly use of electricity.

2. Our entire electric rate structure must be reexamined and drastically revised.

3. Electric-using appliances must be put into the homes and on the farms on a scale heretofore not successfully attempted.

4. All the forces of business, scientific and engineering ingenuity and technique must be concentrated upon the problem of reducing certain of the costs of operation.

5. The people of the country must be brought to realize that there is a pool of electricity lying idle, ready and waiting to be used, and to realize what electricity can do in lightening their burdens, in increasing their incomes and making for a richer and better life.

Turning to the first point of the program: If we load our minds with the idea that because a thing has not been done it cannot be done we might as well admit complete defeat in this whole program. If we admit that the use of electricity cannot be increased manyfold, if that is our mental attitude, then we must be logical and immediately stop construction of the Cove Creek Dam and of the Joe Wheeler Dam. We should forget all about the St. Lawrence development. The work on Boulder Dam should stop tomorrow; Grand Coulee should not be developed. The securities of most of the power companies of the United States should immediately be heavily depreciated. But such a defeatist attitude is not the spirit of America. This country has grown because of its spirit of daring, of adventure, of pushing through difficulties rather than sitting before them and wailing and whining

about them. The very difficulty of the task will sharpen our wits and toughen our determination. Once the American people put themselves squarely behind this objective of an electrified America the greatest single difficulty in the way has been removed.

Way must be found to lower the rates

In my considered judgment the greatest single obstacle in the way of a widespread use of electricity has been the rates which have been charged for electricity. We believe that, with notable exceptions, the rates for electricity throughout the United States constitute a barrier between the people and the great resource of electricity. A drastic revision downward of electric rates is an essential part of this program. Such drastic reductions in electric rates, in our judgment, are essential to any substantial increase in the use of electricity for domestic, farm and industrial purposes. It is our opinion, amply supported by experience, that the effect of such drastic provision will not result in a decrease in gross revenues, or in net income, if the revisions are thoroughgoing and skillfully made.

Some weeks ago, at the direction of the board of the authority, a proposed standard of domestic and farm rates was announced, which were recommended to those communities and farm organizations which might desire to enter into contracts with the authority for power at wholesale. Those rates represent our views as to the first step in a drastic downward revision of electric rates, essential to a wider use of electricity. These rates have been criticised by all manner of statistical jugglers and sleight-of-hand men. There is not time to answer these criticisms in detail. I merely want to say that there is ample confirmation of the soundness of the theory underlying these rates from most competent sources.

Subscribes to Ferguson's philosophy

One recent example will suffice. Our announcement respecting rates outlined a plan for an average 2-cent per kilowatt-hour rate for the fully electrified home. On October 20 Samuel Ferguson, president of the Hartford Electric Light Company, and a recognized utility leader, advocated "that a completely electrified house should be able to earn a rate of 2 cents or less for entire requirements of light, cooking, refrigeration, hot water, etc. This is an idea which has not as yet received universal acceptance, but in my opinion it must be done and done quickly. We find much more profit in the all-electric homes earning rates as low as 1.7 cents per kilowatt-hour than we do in the average home at 4½ cents or the small user at 8 cents, and certainly the users are more pleased." Some leading utility and electric manufacturing executives are not in a position to state publicly their conviction, expressed to me privately, that the existing rate schedule has been a millstone around the neck of the electric industry. I am confident that until some such drastic revision of our ideas about electric rates is put into effect we will continue on a low average use of electricity; we will continue to be faced with the anomaly of a surplus of electric power while the people of the country desperately need and are clamoring for this very service.

Now the reasons for the existing rate schedules are many. Part is due to tradition. There is a tremendous accumulation of musty legal theory and outmoded engineering practices in the field of electric rates. Part of it is due to the fact that domestic and farm electric service is monopolistic, and it is typical of monopolies that they change their practices very slowly, if at all. In many cases it is due to pressure of an outrageous capital structure, to bad management, to lack of foresight. We believe that definite plans of the authority now in process of execution afford the quickest means of accomplishing a thorough revision of rate schedules and rate theories throughout the country, and with it, an increase in the use of electricity. This is an essential part, as I see it, of the new national power program inaugurated by the Tennessee Valley Authority act.

Low rates not, however, the sole answer

We then are faced with this situation. We have and are in process of constructing a tremendous pool of power for the nation, most of which is in private ownership; a considerable percentage of which is represented by governmental investment. A large portion of these power facilities will be idle and unused and a burden upon the investors and on the taxpayer unless we can get electricity through to the people on a broad scale. Low rates which will promote and encourage the use of electricity is an essential part of this program. *But low rates alone will not do the job.* The people must have in their homes and on their farms the appliances, the devices, by which electricity is used. Particularly they must have the heavy use appliances. In the home they must have electric ranges, electric water heaters, refrigerators and the like, with house heating and air conditioning within the range of probability. On the farm they must have motors for many purposes, and water pumps, as well as domestic appliances.

The existing methods of getting these appliances to the average man and woman also requires drastic revision if a widespread electrification program is carried out. It is probably accurate to say that the principal item of cost in getting these appliances into the homes and on the farms has not been the cost of materials and labor in their construction, but has been the cost of financing and selling; in other words, distribution. The 200-odd electric manufacturers of the country are equipped today to turn out the hundreds of thousands of heavy-use electric appliances which the people of the country want and which, under a properly planned program, they can pay for. In fact, with proper rates, the bulk of our people literally cannot afford *not* to own and use such appliances. But I repeat, low rates alone are not enough. Without large-scale distribution of low-cost appliances there will never be a widespread use of electricity. I am calling this matter of electric appliances to your attention because it should be an integral part of this national program. Any one who leaves this factor out of consideration is not thinking this matter through.

Appliance distribution problem to be solved shortly

There are difficulties in the way of effectuating a wide distribution, at low cost, of standardized high-quality electric appliances which the manufacturers of this country are producing. These difficulties are by no means insuperable. While I am not at liberty to discuss the matter at this time, I would be less frank than I have a right to be if I did not say that a definite plan for this phase of the program is approaching completion, with the co-operation of many interests.

Fourth, there is reduction in costs. Time does not

permit of a discussion of our program looking toward reductions in operating and construction costs. Here again we need and will receive co-operation from many sources. To meet the mounting cost of complexities and of losses in transmission networks is particularly a subject upon which the authority hopes to make a contribution. A reduction in costs will inure to lower rates and constantly increase use of electricity.

And then the last point in this program: We must all of us begin to think in terms of an "Electrified America." We must keep before our minds the great potential wealth which is lying at our doors, now idle. What American people want badly enough they get, whether it is the conquering of a wilderness, an education for every child or a decent and orderly revision of our entire economic structure. The imagination of our people must be fired with the prospect of electrified homes. Farmers must be given a picture of what electricity can do to relieve farm life of many of its burdens. The business man must come to see the possibilities for commercial and industrial development which lie ahead, if such a program is carried out.

However much we may desire this objective, we will fail unless we apply to this program practical judgment and sound business principles. This is no task for a mere theorist. This job is too difficult for an enthusiast who faints at the sight of a difficult business problem. This is no job for those who give up the struggle when they meet a really knotty problem. This program for an electrified America calls for a pooling of the energies and ingenuity of the progressive leaders of the utility industry, of the electric manufacturing industry and of government. The stakes are too great for us to permit such a constructive program to fail.

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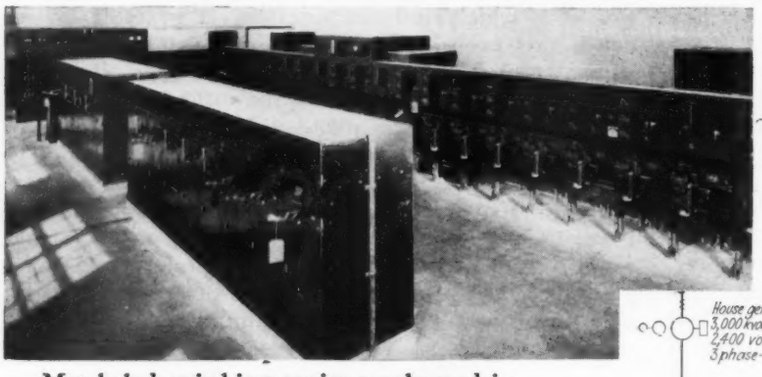
Flexible Station Service at Osage Plant

Provision for the operation of station service auxiliaries and lighting at the Osage hydro-electric plant of the Union Electric Light & Power Company in Missouri includes the use of 2,300-volt supply for the larger apparatus and 480-volt service for smaller units, with sectionalized buses fed either by house generators or from the main units through appropriate transformers. The main features of the plant design were covered in the ELECTRICAL WORLD, Vol. 97, page 1212. The Stone & Webster Engineering Corporation was the designing and construction engineer for the development.

The station service layout illustrates the advantages of a flexible design and also affords an instance of control concentration for auxiliary uses. There are two 2,300-volt station service buses, each served by a 3,000-kva. house service generator and a 2,300-volt emergency bus supplied from the main generators through a 3,000-kva. transformer installation. All three buses can be paralleled by closing automatic bus junction breakers. The major auxiliaries are fed through individual automatic breakers and the 480-volt auxiliaries are divided between the two main station service buses and fed through 450-kva. transformer units connected with the former through automatic breakers.

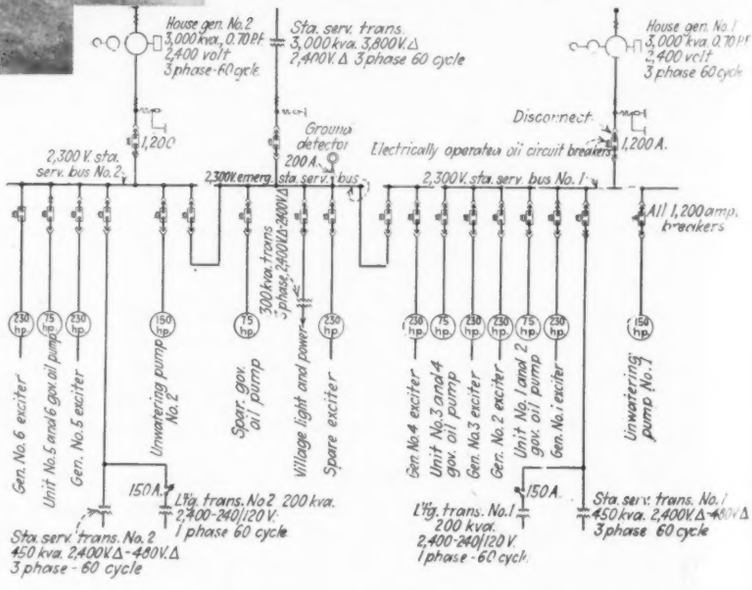
This arrangement insures three sources of supply to any lighting or power circuit working in station service. Rapid handling is provided by the symmetry and simplicity of the layout. The station service is controlled in a room set apart for this purpose, with metal-clad switchboards for both 2,300- and 480-volt equipment. The 480-volt equipment includes air blowers, battery chargers, unit heaters, small motor-driven pumps, electric heating, air compressor and machine shop auxiliary electrical apparatus. The 2,300-volt auxiliaries include generator exciter motors, oil pumps, unwatering pumps and the local lighting and power facilities for the village are fed from the 2,300-volt buses. Safety to operators and ample protection against fire are realized by the use of metal-clad switching equipment in the control room.



Metal-clad switching equipment housed in station service control room

At the left is the 440-volt equipment and at the right that for 2,300-volt service

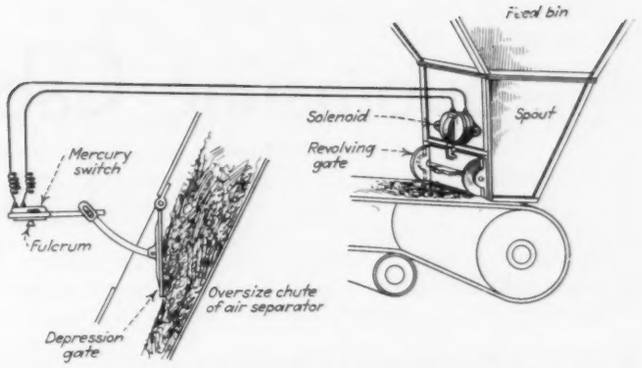
Schematic one-line diagram of Osage station service supply facilities


House gen. No. 2
3,000 kva., 0.70 PF
2,400 volt
3 phase-60 cycle
Sta. serv. trans.
3,000 kva. 3,800 V. Δ
2,400 V. Δ 3 phase 60 cycle
House gen. No. 1
3,000 kva. 0.70 PF
2,400 volt
3 phase 60 cycle
1,200
Ground detector
200 A.
Disconnect
Electrically operated oil circuit breakers
1,200 A.
2,300 V. sta. serv. bus No. 2
2,300 V. emerg. sta. serv. bus
2,300 V. sta. serv. bus No. 1
All 1,200 amp. breakers
Gen. No. 6 exciter
Unit No. 5 and 6 gov. oil pump
Gen. No. 5 exciter
Unwatering pump No. 2
Spar. gov. oil pump
300 kva. trans. 3 phase, 2,400 V. Δ-2,400 V. Δ
Village light and power
Spare exciter
Gen. No. 4 exciter
Unit No. 3 and 4 gov. oil pump
Gen. No. 3 exciter
Gen. No. 2 exciter
Unit No. 1 and 2 gov. oil pump
Gen. No. 1 exciter
Unwatering pump No. 1
150 A.
L'tg. trans. No. 2 200 kva. 2,400-240/120 V. 1 phase 60 cycle
Sta. serv. trans. No. 2 450 kva. 2,400 V. Δ-480 V. Δ 3 phase - 60 cycle
L'tg. trans. No. 1 200 kva. 2,400-240/120 V. 1 phase - 60 cycle
Sta. serv. trans. No. 1 450 kva. 2,400 V. Δ-480 V. Δ 3 phase 60 cycle

Mercury Switch Regulates Conveyor Feed

An interesting application of a mercury switch has been made at the plant of the Santa Cruz Cement Company at Davenport, Calif., to control the feed to the 10-ft. conical mills in the raw-grinding plant. These mills, which operate in a closed circuit with the air separators of the plant, are controlled by inserting a depression gate in the oversize chute of the air separator. The gate is connected by a linkage to a mercury switch which operates a revolving gate in the chute from the feed bin to the main conveyor.

As the feed to the mill increases or decreases the depression gate is raised or lowered according to the quantity of material flowing through the chute, the change in position thus making or breaking the contact of the mercury switch. The latter energizes or de-energizes the solenoid on the revolving gate, which locks or releases that gate, controlling the flow from the feed bin to the conveyor.



Mercury switch controls material flow

This combination of a measuring device in the discharge (the depression gate), a mercury switch and a solenoid brake on the hopper feeder gate provides an inexpensive and practical method of preventing overloading on conveyors and equipment.

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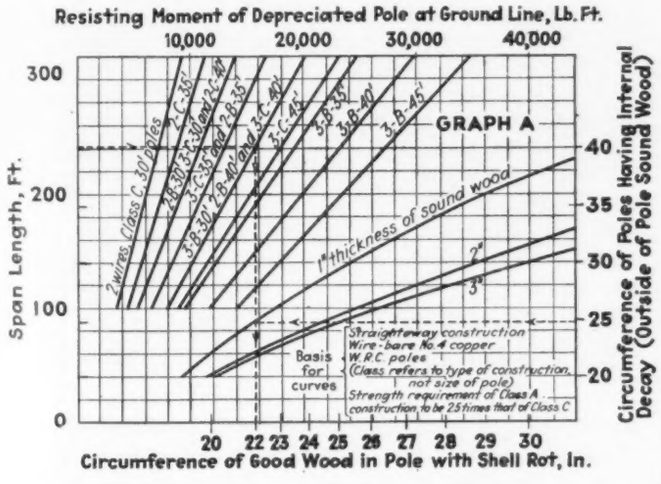
When to Replace Rotted Poles

By B. E. ELLSWORTH

Iowa-Nebraska Light & Power Company, Lincoln, Neb.

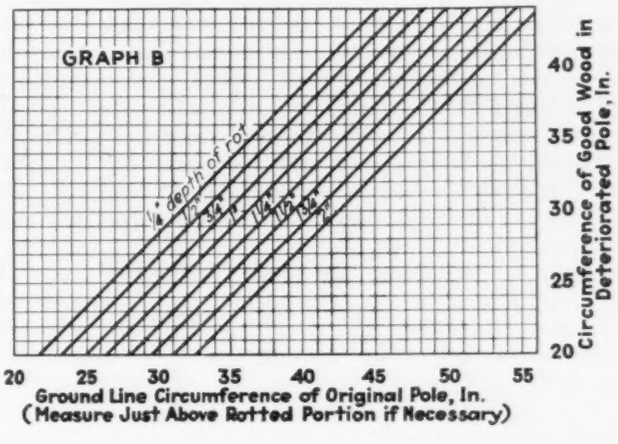
Use of general tables of permissible depth of shell rot to determine replacements of wood poles may often result in the replacing of poles that are perfectly capable of continuing to carry the loads imposed on them. This is because these general tables assume maximum loading on the pole, which is seldom the case in actual practice. The accompanying graphs provide a means by which the inspector can decide whether or not a Western red cedar pole should be replaced. These graphs were based on the use of No. 4 bare copper conductor, but they can be used on poles carrying No. 6 and No. 2 bare copper with very small error, easily within the accuracy of pole measurements.

These curves can easily be used by men in the field if they will spend a few minutes in becoming familiar with them. By scientific pole inspection many poles may be found to be strong enough to support a line for several years which would otherwise be changed, if inspection is done by guesswork.



Aids to determination of needed pole replacements

Assume a class C line consisting of three conductors on 40-ft. poles and with 240-ft. spans. Referring to graph A a horizontal line is seen for 240-ft. spans which intersects the line marked 3-C-40 (three wires, Class C, 40-ft. poles), from which point it projects vertically upward and indicates that 15,800 lb.ft. moment is required of the old pole. On the lower scale, it will be observed that a pole with shell rot having good wood of 22 in. circumference inside the rotten portion will be strong enough and a pole change is not necessary. By use of an increment borer, the depth of shell rot is easily determined, and knowing the circumference of the original pole the circumference of the good wood in the old pole can quickly be found by the use of graph B.



Suppose a pole was originally 25 in. in circumference, and that instead of having shell rot it had heart rot with only 1 in. of good wood around the outside. From the 25 in. circumference on the right scale of graph A project horizontally until the 1 in. thickness of sound wood curve is intersected. Again project down and the strength of this pole with 1-in. shell of good wood is seen to be exactly equal to that of the same pole with ¾-in. shell rot or equivalent to good wood having 22 in. circumference. By inspection of the graph it will be apparent that a pole with a good shell of 2 in. is almost as strong as a solid pole, the heart of the pole affecting the strength but very little.

In some cases shell and heart rot will be found in the same pole, in which case the curves can also be used. In this case the circumference of good wood in the pole is used as the circumference of the pole in the right scale of graph A. A horizontal line is projected across until it intersects the curve representing the thickness of shell of good wood found by borings.

Submarine Cables Located by Amplifier

By G. A. DREWETT*
Northwestern Electric Company, Portland, Ore.

LOCATION of the exact position of a submarine cable which has been installed on a riverbed for a period of time is often necessary to facilitate repairs, dredging operations or new construction. Due to the current and erosion of the riverbed, submarine cables are often shifted from their original positions and covered with mud or silt to a depth of 20 to 30 ft. Determining their exact position, therefore, becomes a lengthy and expensive procedure.

When the U. S. government recently began dredging operations to increase the depth of the ship channel in the Columbia River this problem confronted the Northwestern Electric Company, which had laid three 115-kv. cables across the river 1 mile west of Vancouver, Wash., two years previously. After some preliminary checking by a diver it was soon found that the cables had become buried under gravel and silt and could not be located from an inspection of the river bottom. Attempts were then made to locate the cable by the use of a high-pressure water jet, but this method was unsuccessful chiefly because silt washed back into the cut practically as fast as it was removed. It was suggested that a pick-up coil with some suitable amplifying circuit be tried to locate the cables. [The Pacific Telephone & Telegraph Company employs a similar method for tracing and locating faults on telephone lines while an interrupted electrical impulse is imposed on the conductors.] After conducting a few experiments it was found that the cables could be approximately located from the surface of the water.

When the cables were laid a duplex No. 12 leaded cable had been lashed to one of the main cables in order to provide for telephone communication from a transit man on shore to the barge, primarily for holding a straight course across the river. During the preliminary tests with the amplifier an interrupted impulse was imposed on this duplex cable with a No. 1020C Western Electric test set. This impulse was very easily traced from the surface of the river, but the 60-cycle stray field from the power cable was also traceable. During the final locating operations the 60-cycle hum was depended upon entirely, as it permitted all three cables to be located in one operation, as will be explained later.

Some experimenting was then done to determine the best amplifier circuit to employ and also the best pick-up or exploring coil. The amplifier circuit used by the telephone company was of the resistance-coupled type, because the set was sometimes employed where quality of tone was necessary. In locating power cables, however, it was most important to obtain the maximum tone volume with a given weight of equipment, sacrificing some tone quality if necessary. Also, an exploring coil of relatively small dimensions was desirable for convenience in handling by the diver. The amplifier circuit, shown diagrammatically in Fig. 1, is self-explanatory.

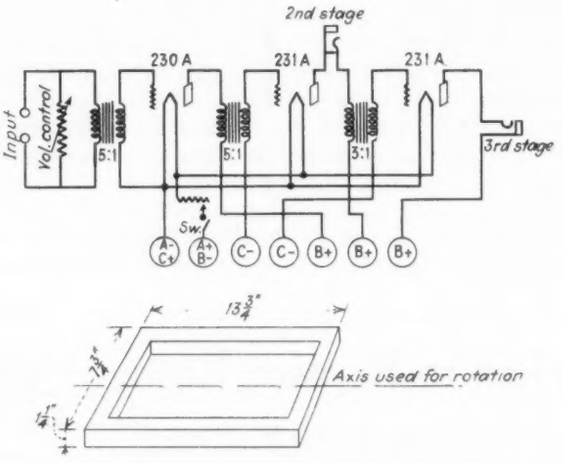
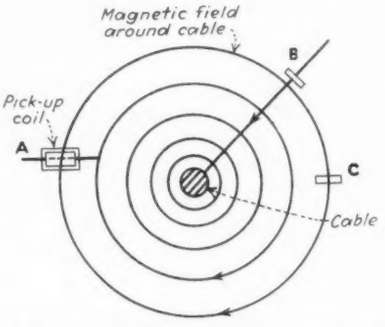


Fig. 1—Amplifier circuit and pick-up coil

Tubes are shielded in order to reduce interstage coupling thereby obtaining a higher amplification without howling. The equipment with spare parts and accessories was housed in a portable case. The exploring coil was connected to a 200-ft. length of twin-conductor "Tyrex" portable cord wound on a small hand-cranked reel equipped with collector rings and brushes for taking lead to the amplifier. The exploring coil consists of 200 turns of fine wire wound on a rectangular wooden frame, the whole being thickly covered with rubber tape and stay binding which was given several coats of waterproof varnish.



In positions A and B pick-up coil detects no tone, while in position C the tone is maximum. In locating cable axis of coil was placed in general direction of cable and rotated until no tone was emitted (B). By determining the zero-sound positions of the coil, when it is moved horizontally over the cable, the position of the cable can be located.

Fig. 2—Relative positions of pick-up coil in cable field

For the purpose of records and future dredging and maintenance operations it was decided to locate the cable at 200 ft. intervals completely across both the Columbia River and Oregon Slough crossings. These locations were carefully plotted on cross-section paper by transit men on shore. When the cables were located by means of the amplifier a heavy lead weight was placed at this point by the diver and the weight located by plumbing a steel line fastened to the weight. This line

From a paper presented at the Engineering Section meeting of the Northwest Electric Light and Power Association, Portland, Ore.

was then "shot" by the transit man and plotted on the map with reference to the center line between towers.

Operation of the device is simple. Consider the sketch shown in Fig. 2, which represents the normal magnetic field emanating from one of the conductors. When the plane of the coil is held at right angles to the direction of the cable, as shown in A, Fig. 2, no tone will be heard in the phones. If the axis of the coil be placed parallel to the direction of the cable (B, Fig. 2) and rotated so that the plane of the coil is tangent to the lines of force no tone will be heard. However, as the plane of the coil is rotated on its axis from position B to position C the tone will increase, becoming maximum when the plane of the coil is pointing directly at the cable.

It is more difficult for the human ear to distinguish between slightly varying intensities of sound than to recognize the complete subsidence of sound. Therefore in locating the cable it was always attempted to rotate the coil into position B until all hum had completely died out. By maneuvring up and down stream, each time rechecking the zero-sound position of the coil, a point directly over the cable could be quickly determined. Telephone communication was held at all times with the diver, who was instructed for movement of coil and final spotting of the weight. To facilitate operations, it was attempted to transmit the pick-up hum to the diver, but because of lack of power in the amplifier not much success was obtained.

When three cables are present, spaced on a horizontal plane some 4 ft. apart, it should be appreciated that unless the pick-up coil is nearly in the same plane and some considerable distance to one side pick-up will occur from two of the cables when tuned out on the third. As a matter of fact, the diver is working between the three cables during most of the locating operations. At first thought it would seem impossible, then, to locate any one cable in particular, but after some practice it was noted that each cable produced a distinctly different tone. A reasonable explanation for this is that a slight difference in wave shape, due to a somewhat different type of load on the three cables, produces a modulation of the 60-cycle hum in the headphones.

Cables were thus located across the river and plotted on cross-section paper. The government was then allowed to work its cutter dredge up to within approximately 40 ft. of the cable, both on the up-stream and down-stream side. By dredging considerably deeper than required, for about 80 ft. each side of this undredged section, it was hoped that the water would scour out the remaining silt and eliminate the necessity for further dredging. However, this expectation did not materialize in the allotted time, so a suction dredge, selected to reduce the possibility of injuring the cable, was used to remove the remaining silt. The cable was found to be within a few inches of where the coil indicated it would be, except for depth. This section must have been scoured out just prior to the location of the cable and later washed full again, as the cable was located about 7 ft. below the soundings taken earlier in the year.

The location of an 11-kv., three-conductor, rubber-insulated, steel-armored submarine cable also had to be checked. It was thought that the magnetic field of the three conductors would be neutralized within the steel armor so that no field would be radiated. On testing, however, the hum was found to be much louder than from the single-conductor, copper-armored, 115-kv. cable.

It is contemplated later to add a small "Kuprox" rectifier in the output circuit, together with a milliammeter, in order to obtain visual indication as well as audible. This would be useful at times when only direction is desirable and not when attempting to distinguish between tones of different phase cables.

Although not yet tried, it is expected that this pick-up amplifier device will be very useful in locating cable faults. For such purposes one method would be to form a continuous arc at the fault by means of a constant-current transformer and then trace to this arc with the pick-up coil. Other methods would no doubt suggest themselves.

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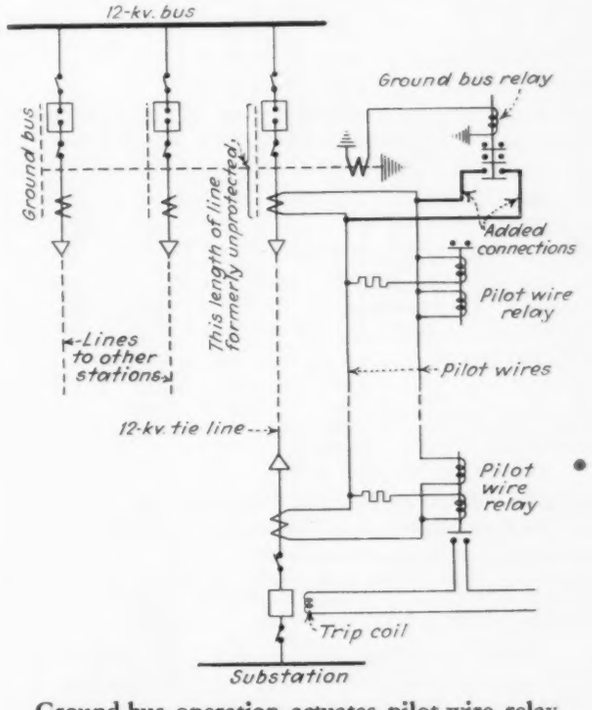
Combined Ground-Bus and Pilot-Wire Protection

By L. N. MOORE

System Development Division, Commonwealth Edison Company

Ground-bus protection in the generating stations and bulk-supply substations of the Commonwealth Edison Company, Chicago, has been extended to guard against feed-back in 12-kv. tie lines. The normal ground-bus layout is designed to clear the affected bus section in



Ground-bus operation actuates pilot-wire relay

case of a substation fault, but such clearance will not cut off the fault current if the fault occurs on the line side of a tie-line breaker and the line is connected to a possible source of feed-back energy and there are no overcurrent relays at the far end of this tie line. The tie lines are equipped with pilot-wire relays connected

to current transformers at both ends of the line so that a cable fault will unbalance the current transformer secondaries and trip the breaker at the far, or receiving, end of the line. However, if the fault occurs between the current transformer and the circuit breaker at the sending end there will be a ground-bus operation at that end, but no breaker opening at the far end since the two current transformer secondaries are not unbalanced. If the tie line is so connected in the system as to feed energy back the fault may persist with damaging results.

A simple addition was made to the ground-bus relay connections. Thus, when the ground-bus relay for the bus section from which this particular line takes off operates due to the fault on its breaker, the current transformer feeding the pilot-wire relay is short circuited. This causes the pilot wire circuit to become unbalanced and the relay at the remote end operates to open the circuit breaker at that end of the tie line and thus prevents the possibility of current flowing back into the fault.

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The Proper Guy for the Job

By J. F. NASH

Appalachian Electric Power Company, Bluefield, W. Va.

Ample and safe guying will be assured if these data are applied. They are based on the assumption that the line is properly sagged at installation; that is, for 50 to 60 per cent of ultimate conductor strength for the worst conditions that prevail. They should indicate where light guys can be used at a saving in line cost and emphasize the advantage of placing the guy anchor well away from the pole to be guyed. By so doing the possibility of anchor creepage is also greatly reduced and confidence in the holding power increased.

Table I—Maximum Stresses in Line Conductors When Properly Sagged

Number and Size of Line Conductors	Per Cent of Ultimate 50	60	Number and Size of Line Conductors	Per Cent of Ultimate 50	60
Copper B.H.D.			Copper T.B.W.P.		
2 No. 6	.....	1,500	2 No. 6	.....	1,000
3 No. 6	.....	2,300	3 No. 6	.....	1,500
4 No. 6	.....	3,000	4 No. 6	.....	2,000
6 No. 6	.....	4,500	6 No. 6	.....	3,000
2 No. 4	.....	2,400	2 No. 4	.....	1,500
3 No. 4	.....	3,600	3 No. 4	.....	2,300
4 No. 4	.....	4,800	4 No. 4	.....	3,000
6 No. 4	.....	7,200	6 No. 4	.....	4,500
3 No. 2	4,500	5,400	3 No. 2	2,900	3,600
4 No. 2	6,000	7,200	4 No. 2	3,900	4,800
6 No. 2	9,000	10,800	6 No. 2	5,800	7,200
3 No. 1	5,900	7,000	3 No. 1	3,400	4,100
4 No. 1	7,800	9,400	4 No. 1	4,600	5,500
6 No. 1	11,800	14,000	6 No. 1	6,800	8,200
3 No. 1/0	7,400	.....	3 No. 1/0	4,300	.....
4 No. 1/0	9,800	.....	4 No. 1/0	5,700	.....
6 No. 1/0	14,800	.....	6 No. 1/0	8,600	.....
3 No. 4/0	14,500	.....	3 No. 4/0	8,600	.....
4 No. 4/0	19,400	.....	4 No. 4/0	11,500	.....
6 No. 4/0	29,000	.....	6 No. 4/0	17,200	.....
A.C.S.R. Bare			A.C.S.R. Bare		
2 No. 4	.....	2,000	2 No. 2	.....	3,200
3 No. 4	.....	3,000	3 No. 2	.....	4,800
4 No. 4	.....	4,000	4 No. 2	.....	6,400
6 No. 4	.....	6,000	6 No. 2	.....	9,600

Table II—Ratio of Side-Guy Stress to Total Conductor Load for Various Angles and Pole Heights

Example—Conductors, 3 No. 4 B.H.D. copper; pole height, 35 ft.; angle in line, 15 deg.; distance of guy from pole, 75 ft. *Solution*—Guy-stress factor = 1.10; maximum conductor stress (Table I) = 3,600; side-guy stress = 1.1 × 3,600 = 3,960 lb.

Pole Height	Distance of Guy from Pole	Angle in Line (Degrees) 5°	10°	15°	20°	25°	30°	35°	40°	45°
30 Ft.	5 Ft.	0.42	0.84	1.26	1.67	2.08	2.49	2.89	3.29	3.68
	10 Ft.	0.23	0.45	0.67	0.89	1.11	1.33	1.54	1.75	1.96
	15 Ft.	0.17	0.33	0.49	0.65	0.81	0.97	1.13	1.28	1.44
	20 Ft.	0.14	0.27	0.40	0.54	0.67	0.90	0.93	1.06	1.18
35 Ft.	5 Ft.	0.50	1.00	1.49	1.98	2.46	2.94	3.42	3.89	4.36
	10 Ft.	0.26	0.52	0.78	1.04	1.29	1.53	1.79	2.04	2.28
	15 Ft.	0.19	0.37	0.55	0.74	0.92	1.10	1.27	1.45	1.62
	20 Ft.	0.15	0.30	0.45	0.60	0.75	0.89	1.04	1.08	1.32
	25 Ft.	0.13	0.27	0.40	0.52	0.65	0.78	0.90	1.03	1.15
40 Ft.	5 Ft.	0.58	1.16	1.74	2.32	2.89	3.45	4.02	4.57	5.11
	10 Ft.	0.30	0.60	0.89	1.19	1.48	1.78	2.07	2.35	2.63
	15 Ft.	0.20	0.43	0.63	0.84	1.05	1.25	1.46	1.66	1.85
	20 Ft.	0.17	0.34	0.50	0.67	0.84	1.00	1.16	1.32	1.48
	25 Ft.	0.15	0.30	0.44	0.58	0.72	0.86	1.00	1.13	1.27
	30 Ft.	0.13	0.26	0.39	0.52	0.65	0.77	0.90	1.02	1.14
45 Ft.	5 Ft.	0.80	1.58	2.37	3.15	3.92	4.69	5.45	6.20	6.94
	10 Ft.	0.35	0.67	1.00	1.33	1.66	1.98	2.30	2.62	2.94
	15 Ft.	0.24	0.47	0.70	0.93	1.16	1.38	1.60	1.82	2.04
	20 Ft.	0.19	0.37	0.55	0.73	0.91	1.09	1.27	1.44	1.61
	25 Ft.	0.16	0.31	0.47	0.62	0.77	0.93	1.07	1.22	1.37
	30 Ft.	0.14	0.28	0.42	0.55	0.69	0.83	0.96	1.09	1.22
	35 Ft.	0.13	0.26	0.38	0.51	0.63	0.76	0.88	1.00	1.12

Table III—Ratio of Stress in Dead-End and Head Guys to Total Conductor Load (Longitudinal Guys Only)

Example—Conductors, 3 No. 4. B.H.D. copper; pole height, 35 ft.; distance of guy from pole, 15 ft. *Solution*—Maximum conductor stress (Table I) = 3,600; head-guy stress factor = 2.1; guy stress = 2.1 × 3,600 = 7,560 lb.

Pole Height	Distance of Guy From Pole	Factor	Pole Height	Distance of Guy From Pole	Factor
30 Ft.	5 Ft.	4.8	40 Ft.	10 Ft.	3.5
	10 Ft.	2.5		15 Ft.	2.4
	15 Ft.	1.8		20 Ft.	2.0
	20 Ft.	1.6		25 Ft.	1.7
35 Ft.	10 Ft.	3.0		30 Ft.	1.5
	15 Ft.	2.1	45 Ft.	10 Ft.	2.7
	20 Ft.	1.7		15 Ft.	2.1
	25 Ft.	1.5		20 Ft.	1.8
	30 Ft.	1.4		25 Ft.	1.6
				30 Ft.	1.5

Table IV—Maximum Allowable Stresses in Various Guy Materials for Grades A, B and C Construction

The values for grade C construction can be used in general work where special conditions are not met. The last column applies to longitudinal guys at places other than dead ends.

Size and Kind of Guy	Transverse Loads A and B	C	Dead-End Loads A and B	C	Longitudinal Loads A, B and C
½-in. Copperweld, extra heavy strength	10,200	16,300	10,200	16,300	20,400
½-in. Copperweld, 30 per cent high strength	5,700	9,000	5,700	9,000	11,300
3 No. 6 Copperweld, 30 per cent extra high strength	4,100	6,500	4,100	6,500	8,200
3 No. 8 Copperweld, 30 per cent extra high strength	2,800	4,500	2,800	4,500	5,500
3 No. 8 Copperweld, 30 per cent high strength	2,300	3,600	2,300	3,600	4,500
½-in. Galvanized, high strength	5,400	8,100	5,400	8,100	10,800
½-in. Galvanized, Siemens-Martin	3,500	5,200	3,500	5,200	6,900
½-in. Galvanized, mild steel	2,100	3,200	2,100	3,200	4,200

West Maintains Activity; Southern Industries Slacken

During October industrial activity in the West continued at an average level equal to that of September and slightly higher than in August, this region therefore making a somewhat more favorable showing than other parts of the country. There was, however, a moderate change of balance as to the several industry groups.

Reports of energy consumption indicate an increase of 6 per cent in the rate of activity for chemicals, and of 4 per cent for paper and pulp, balanced by a decrease of 6 per cent in the food industry and of 5 per cent in rubber products, other groups moving but slightly from the September figures. Except in foods, the rate of operation a year ago was exceeded in varying degrees. The most pronounced gains occurred in those industries that reflect activity in construction—forest products 14 per cent, stone, clay and glass 66 per cent, the metals group 76 per cent, shipbuilding 28 per cent.

To incorporate delayed returns the September index numbers were in several instances recomputed. The chief effect was to lower the figure for forest products, thereby also reducing the regional average somewhat.

In the South recessions all along the line cut the regional average 7 per cent from September, leaving a year to year gain of 8 per cent. The important textile industry lost only 3 per cent, but the group of metal industries fell 11 per cent. In step with the automobile industry in the country as a whole rubber products declined sharply. The stone group receded 43 per cent under last year's rate.

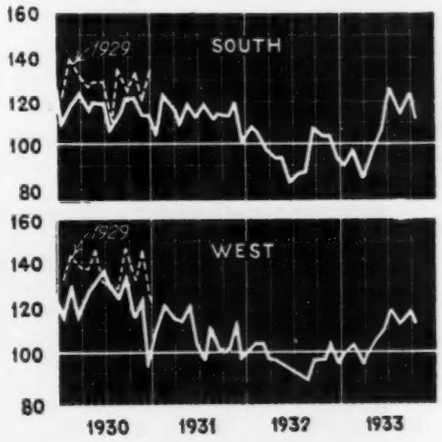
Index of monthly manufacturing activity, South and West

Base: Average month 1923-1925 = 100

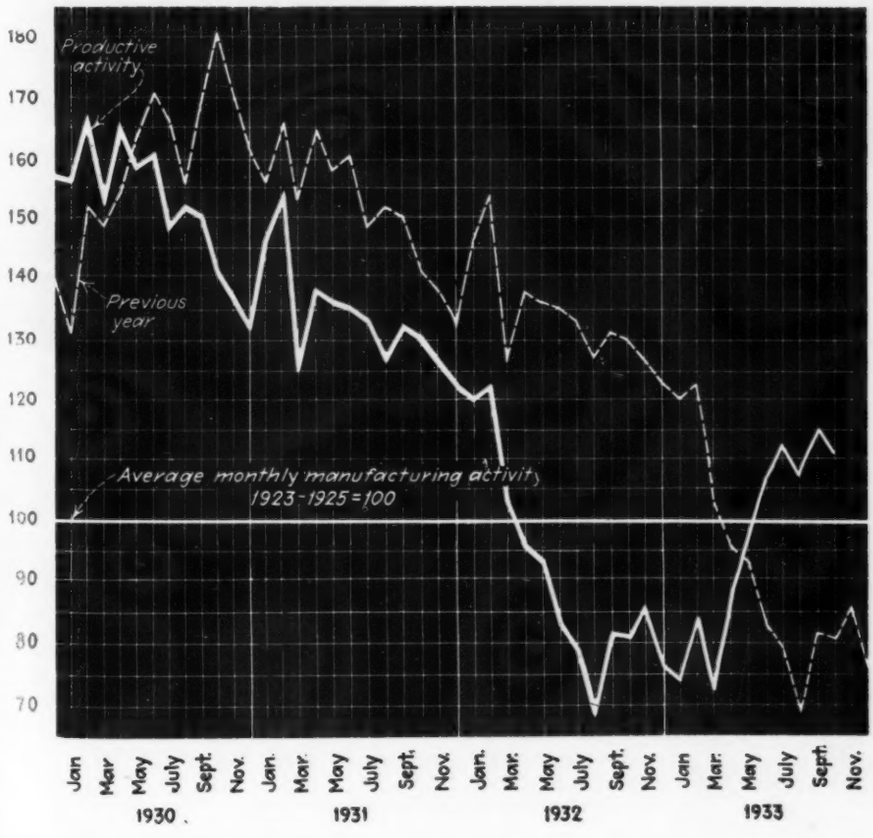
(Corrected for number of working days, but not for seasonal variation)

	South					West				
Industrial Groups	Oct., 1933	Sept., 1933	Aug., 1933	July, 1933	Oct., 1932	Oct., 1933	Sept., 1933	Aug., 1933	July, 1933	Oct., 1932
All Industry	**112.5**	**121.3***	**114.8**	**125.7**	**103.8**	**112.7**	**112.8***	**111.7**	**118.3**	**96.8**
Chemicals	163.3	181.0	154.0	155.0	146.8	91.2	85.8*	80.0	87.5	86.0
Food products	167.8	174.8*	156.5	170.7	151.0	111.3	119.3	115.8	132.2	112.0
Iron and steel	96.8	114.8*	147.8	145.0	85.7	....	....	....	....	....
Metal working	90.0	99.1	95.2*	99.7	64.3	....	....	....	....	....
Metals group	94.8	107.8*	124.5*	124.8	76.2	75.3	76.2	71.4	70.3	42.8
Forest products	50.8	53.5*	51.6	54.4	50.5	151.7	153.1*	154.5	156.0	132.8
Paper and pulp	179.0	186.7*	167.8*	173.6	145.0	145.4	138.2	134.0	150.3	139.5
Rubber products	91.8	129.7*	135.8*	148.4	78.6	92.5	97.0	108.7	125.3	75.8
Shipbuilding	....	....	....	....	....	113.2	113.0	117.2	113.6	88.5
Stone, clay and glass	64.4	101.8*	89.3*	121.0	113.8	118.2	119.6*	116.0	118.0	71.3
Textiles	120.0	124.0*	123.0	146.0	107.8	....	....	....	....	....

*Revision.



Electrical Works Hold Autumn Level



Much greater activity than a year ago is revealed by reports of energy consumption in electrical manufacturing establishments, though the rate of operations in October decreased 3 per cent from September. Half a year ago a vigorous recovery set in, putting an end to the relative inactivity that had prevailed since the early part of 1932. During the past few months the rise has been slower, with fluctuations. October was 38 per cent above 1932.

For a time last spring the smaller manufacturers were considerably more active than the large ones, measured in each case against the 1923-1925 average. This disparity virtually vanished in July and has not reappeared.

Monthly Index of Electrical Manufacturing Activity

Adjusted to 26 working days

Base: Average Month, 1923-1925

Month	1930	1931	1932	1933
January	156.2	146.6	120.0	74.0
February	165.2	154.3	122.2	83.3
March	153.0	126.1	102.9	75.0
April	164.9	138.1	95.6	89.4
May	158.0	136.7	92.8	104.1
June	160.2	135.2	83.1	106.9
July	148.5	133.4	79.2	114.0
August	152.2	126.9	67.6	108.4
September	150.0	132.6	81.4	115.2
October	140.6	130.4	80.9	111.7
November	137.5	126.9	85.6	....
December	132.4	123.5	76.0	....

Industrial Activity Slower, But Far Above 1932

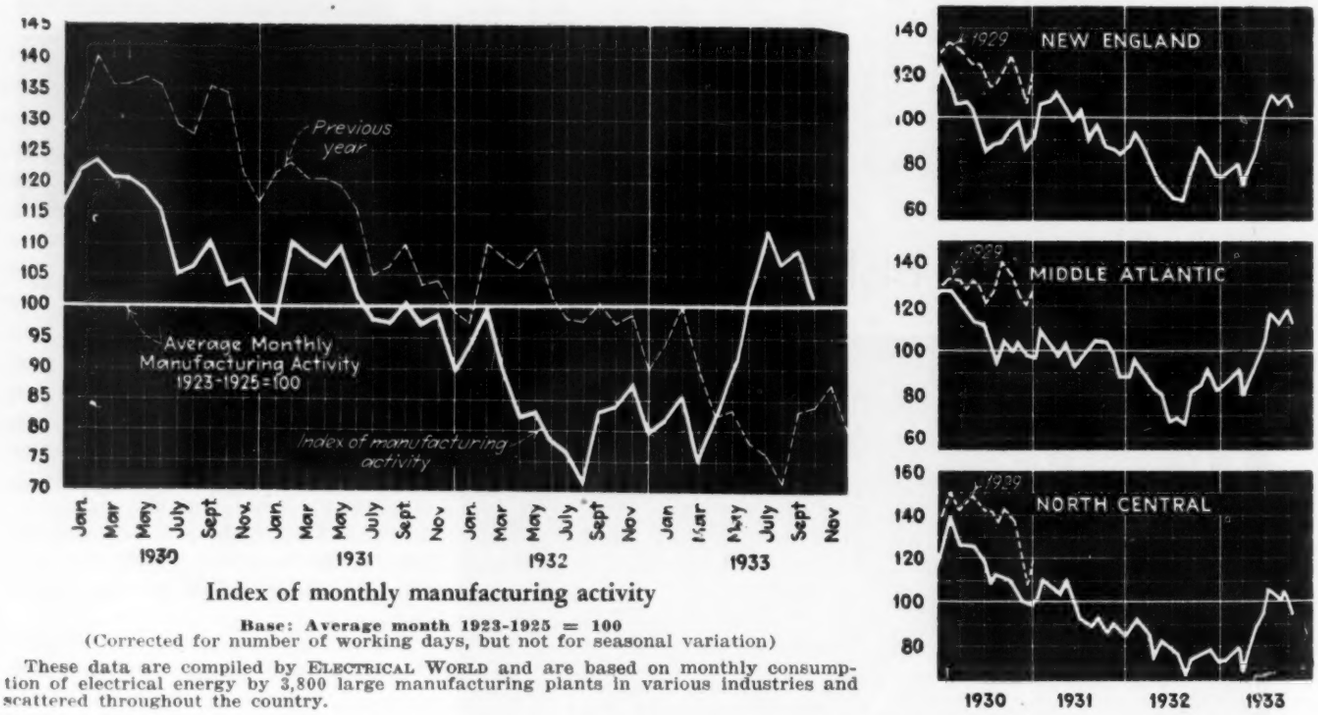
Recessions that were fairly widespread though in general moderate as to magnitude are indicated by reports of electrical energy consumption during October received by ELECTRICAL WORLD. Adjusted for differences in the number of working days the weighted average for all industries decreased 6 per cent compared with the rate of industrial activity in September (revised to incorporate delayed returns) but remained 19 per cent higher than in October of last year.

Notwithstanding this tendency to slacken production somewhat, every industrial group except leather products was operating at a higher level than a year ago—considering the country as a whole—and with a few exceptions similar statements hold true for the several geographical divisions. Thus, in the automobile industry operations are 35 per cent higher than they were a year ago, though down 17 per cent from September. Iron and steel, off 6 per cent for the month, is up 2 per cent for the year, while the metal-working industries, continuing almost unchanged at the level attained in July, show a year's gain close to 50 per cent.

In lumber products there have been only minor fluctuations during the past five months; gains beginning in the autumn of 1932 have been maintained; the net rise from July, 1932, amounts to 42 per cent, and from October, 1932, to 11 per cent. All the construction materials industries therefore show a general tendency to hold up to recent levels, which are well above those prevailing a year ago, with the exception of the stone group.

The decrease of 5 per cent from September in the average for New England was due largely to greatly curtailed energy consumption during October in a group of chemical plants after an abnormal upward leap in the preceding month. Textiles held steady; the other very important group, metal-working, sagged but slightly.

In the Middle Atlantic region the net result of changes was to drop the average 2 per cent to the August level. Chemicals increased; foods decreased; the stone group, chiefly cement manufacture, lost 11 per cent. Declines in automobiles, foods and metals contributed to the 9 per cent North Central loss.



Index of monthly manufacturing activity

Base: Average month 1923-1925 = 100
(Corrected for number of working days, but not for seasonal variation)

These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,800 large manufacturing plants in various industries and scattered throughout the country.

	United States				New England				Middle Atlantic				North Central			
Industrial Groups	Oct., 1933	Sept., 1933	Aug., 1933	Oct., 1932	Oct., 1933	Sept., 1933	Aug., 1933	Oct., 1932	Oct., 1933	Sept., 1933	Aug., 1933	Oct., 1932	Oct., 1933	Sept., 1933	Aug., 1933	Oct., 1932
All Industry	**101.5**	**107.7***	**106.2**	**85.1**	**105.0**	**110.4***	**108.1**	**90.2**	**113.7**	**116.4***	**114.4**	**86.8**	**95.3**	**104.1***	**101.5**	**75.4**
Automobile (including parts and accessories)	51.1	61.8	63.7	37.7	....	....	....	....	63.4	67.5*	63.5	47.2	49.3	60.8*	63.8	38.6
Chemical products (including oil refining)	158.9	159.6*	152.5	129.0	147.5	188.5	153.0	153.6	171.5	166.4*	163.0	131.8	145.0	150.3	144.4	110.2
Food products	120.3	137.0*	133.3	118.3	....	....	....	....	131.7	150.9*	143.0	110.0	114.0	132.6	132.0	116.8
Iron and steel	83.5	89.3*	88.3	54.8	140.0	149.0	153.2	100.3	72.5	76.3*	73.2	41.3	88.1	95.6	95.2	59.5
Metal working	79.0	80.6*	76.4	53.0	113.7	115.6	108.8	79.3	68.8	69.5*	66.3	51.6	81.0	84.0	78.4	45.6
Metals group	80.7	83.8*	80.7	53.8	121.0	125.0	121.4	85.3	70.4	72.5*	69.4	47.2	83.8	88.4	84.8	50.9
Leather products	90.6	92.4*	101.2	93.7	85.2	81.7*	89.2	95.5	104.2	110.2*	123.2	103.1	78.5	82.5*	85.0	79.6
Forest products	98.5	100.3*	99.7	88.5	55.8	59.8*	60.3	44.0	71.7	72.0*	63.2	53.6	95.4	102.4*	101.0	83.5
Paper and pulp	134.5	139.5*	130.0	111.3	144.7	153.0*	135.4	115.3	107.8	105.6*	108.5	68.1	125.3	138.8	123.0	112.2
Rubber products	113.8	131.0*	143.5	86.5	116.0	133.9*	141.7	105.4	....	....	....	....	109.8	126.8	140.0	77.0
Shipbuilding	82.0	83.5	80.0	72.3	....	....	....	....	....	....	....	....	....	....	....	....
Stone, clay and glass	88.8	100.4*	105.1	84.3	....	....	....	....	72.0	81.3*	92.8	66.7	113.2	123.7*	127.6	109.3
Textiles	106.9	109.2*	110.3	94.8	80.7	80.4*	85.8	78.3	154.0	155.3*	151.2	122.8	147.0	145.0*	126.5	117.5

*Revision.

How to Sell Homes

By H. P. LIVERSIDGE*
Vice-President Philadelphia Electric Company

WE HAVE chosen to regard our domestic market as a retail class of business. When judged in terms of present-day average monthly revenue per customer—less than three dollars—and the number of customers many thousand times as great as in the commercial and industrial field—there seems little room for argument. On the other hand, measured in terms of potential possibilities, our job might well be considered as the development of a wholesale market in the domestic field. Regarded in this light, it becomes apparent that a great amount of preparatory cultivation becomes necessary before we can hope to reap a commensurate reward for our sales effort. The difficulty, in fact the apparent impossibility, of maintaining any reasonable amount of personal contact presents obstacles in the further development of this great market which fall outside the realm of our past business experience. No matter how certain we may be of our ability to provide a satisfactory supply of electrical energy, which we know to be at a low cost, it is evident that we are dealing with a great psychological problem—a problem of human relations—and I frankly believe its solution will determine, in large measure, the future status of the entire industry. Unless we clearly understand what we are facing and direct every effort toward the early solution of these difficulties, we must accept the conclusion that our troubles—in fact, the resistance to sales—may increase in a direct ratio to the wider use for domestic purposes. It is possible that it may increase at even a greater rate.

The approach to selling more kilowatt-hours in the domestic market is not the precise competitive problem of rate application to demand and energy requirements. Today's problem in building the domestic market takes us across new frontiers. No matter how proudly certain we are of our technical ability to supply electricity at low cost, we must realize that there is more to marketing than simply manufacturing and delivery. Delivering electricity is not necessarily synonymous with delivering satisfaction. Developing the domestic business means marketing satisfaction to millions. The chief factors in this equation are not voltages, capacities or efficiencies, but buyer attitudes and reactions and customer psychology. The problem—or problems, rather—seems to be, first, a customer relations problem, then a sales problem and, lastly, an engineering problem. Here is an exact reversal of our past order of approach, and thus it becomes much more difficult. We have not learned to attack the job of increased sales from this viewpoint.

To put it simply, the domestic market depends first of all upon creating a better feeling between the domestic customer and ourselves. We know that no great field exists in a mere increase in the number of domestic customers; rather, our growth must come through the greater use of our service by existing customers, the conversion of the small consumer to a larger user. And customer-attitude will play an important part in this program. Therefore, we must ask: What do our present customers think of us and our service? What is the nature of the sales resistance to our program of selling them more kilowatt-hours? What must be the character and intensity of our efforts to offset the constant bombardment of antagonists and critics of our industry whose statements are directed to the undermining of public opinion and public confidence—building up sales resistance, if you please? Upon the answer to these questions our initial success in greater domestic market-building depends. In fact, it is not too much to say that upon the answer may depend the future status of our entire industry.

Of one thing we can be reasonably certain, a customer's first interest in us is not in our technical efficiencies, nor in the mechanics of our commercial operations. The customer's interest lies in his own affairs, and we enter the picture when the electric bill enters the budget and as the electric service enters into his standard of living. We believe that if the normal customer views his utility service rationally today he will consider his self-interest to be ably served. But note this highly significant fact. When the customer distrusts his utility company, rational appreciation of its service and its costs is no longer possible. Unless we are able to maintain the complete confidence of the domestic customer in ourselves and our conduct of the business of supplying his electricity, no sales effort will prevail, even though we produce so efficiently that our rates can be still further markedly reduced.

Let us inquire a little further into the average customer's viewpoint regarding his bill. Does he understand the basis on which the bill is rendered? I for one believe he does not.

Most of us use language that, to say the least, is rather misleading. For example, we like to speak of our rate as a tariff. I wonder sometimes whether this term becomes synonymous with tax in the mind of the average customer. What objection, for instance, would there be to a much more homely use of price list for the different

**Abstract of address presented before Pennsylvania Electric Association.*

quantities of kilowatt-hours purchased? His knowledge of our rate is the price of the top block. In fact, he has no conception whatever of the relation between use and cost. The cost of service rises with increasing use, due to the various appliances which are added. This, in turn, is interpreted by the average customer as an indication of increased rate. Thus when utility antagonists glibly talk of too high a rate for electric service the customer impulsively agrees, for he knows his bill for electric service has been continually increasing, forgetting entirely the fact that his increased use has been the cause.

If we are to develop our domestic market to its fullest extent; if the home and homemakers of this great nation are to be given those advantages, comforts and labor-saving devices that are so intimately a part of our higher standard of living, we must squarely face the problem of developing an understanding between the domestic customer and ourselves which will insure a friendly attitude and a growing appreciation of the small cost of this service in relation to the other items of the domestic budget.

Our problem, therefore, in brief, is one of customer-education—an establishment of confidence through the development of understanding. And this program, mark you, must be carried out with full appreciation of the great volume of antagonistic, critical statements which have had their cumulative effect in undermining the confidence of the public. A list of things that are misunderstood by the average customer would necessarily include:

The meter—a thing of mystery.

The reading of the meter.

The calculation of the bill.

The relation between use and the total cost for such use.

These are but a few of the causes of customer-misunderstanding, but they will serve as examples.

Too technical and too complacent

Reviewing our history, I am inclined to believe that from an operating man's viewpoint, at least, we have been too deeply engrossed in the development of an efficient plant for production and delivery of electrical energy, and that perhaps we took too much pride in the outstanding accomplishments which resulted in an almost perfect service, and in reducing the cost for such service to an almost unbelievable amount. We have taken pains to dazzle the public by elaborating on the complicated technical problems we have had in the establishment of our great generating systems, and in the construction of our vast and complex transmission and distribution network. Actually, we have taken real pleasure in telling of these accomplishments, and we may have appeared a little egotistical in relating the story. Now we must alter our program of education; we must forget technicalities and talk public benefits. The user's interest lies in the quality of service and the price paid, and we must talk about that. In this, we must recognize that the domestic customer, after being satisfied that the quality of the service we deliver is of the best, must be satisfied that the price, too, is right. If he is satisfied on these two points, he will buy this service in ever-increasing amounts. If he does not believe this he will take what he must, but in a most grudging manner. Thus, in the future, we must make sure of this customer-satisfaction or the ordinary trend toward greater use will be nullified.

In striving for customer-satisfaction, we face a most peculiar condition and one that cannot be solved by any set rule or theory. If we approach the future on a basis of our experience during the past few years we might draw the inference that the better our service, the lower the cost, the more complaints we will receive. One might arrive at the conclusion, therefore, that a "do nothing" policy, particularly in so far as sales are concerned, would be the safest program. Of course, we know this is ridiculous, for there could be but one result to such a program. We would lose our initiative, even lose the satisfaction in our past accomplishments, all of which ultimately would adversely affect the very standards that we have worked so many years to create.

What the customers must understand

What is it about customer-satisfaction that needs better customer-understanding? In my opinion, it is that our service does and will contribute more to his standard of living than any other item in his budget in proportion to its cost. Increasing the domestic market will mean greatly increased service for a somewhat larger share of the family budget. But this makes us pause. If the customer fears the utility that takes 2 per cent of his budget, how much more will he fear the electric company to which he pays an increased part of his income, unless—and this is the crux of the matter—he is first taught to believe in the company and welcome the service it provides?

No better start could be made on such a program than to analyze thoroughly the conduct of our business, uncover the "mysteries" and see wherein we are responsible for customer-misunderstanding or distrust. Are we conducting our business in its customer aspects like a "big monopoly?" Are there any employees among us who treat customers so that a "helpless" inferior feeling is created in the customer's mind? Are there policies and practices affecting a considerable proportion of our customers which speak louder than the words of our critics that the utility is abusing its position and the small customer is helpless? Are we fully educating the public in our business; are we really showing him how more use and a higher bill are to his real advantage?

After we make sure that every aspect of the conduct of our business has customer-understanding as a prime purpose we must enlighten our customers on the *value of our growth to their good*. We must broadcast the facts about ourselves that prove this point in so simple a way that the least among our customers may understand.

Just because I have dealt so far chiefly with certain psychological aspects of the sales resistance encountered in the development of our domestic market, I do not want any one to get the idea that I am oblivious to the necessity for good old-fashioned promotional sales effort. I still realize that, in the last analysis, the sale of kilowatt-hours to our domestic customers is dependent upon the use these customers make of lighting and appliances. So that no one will be misguided by my remarks to this point, I will state hurriedly and briefly for the record a few of my older convictions relating to sales that haven't been changed one iota.

I still believe we must make sure our domestic customers have adequate wiring installations; I continue to stress that they must be thoroughly sold on the value of good lighting in the home; I am more strongly of the belief than ever that they must be sold a complete installation of labor-saving appliances, and, lastly, I am

forever insistent that they must be so thoroughly convinced of the pleasure of doing things electrically that they would not be satisfied to do them in any other manner.

And so that no one may have any doubts about my present attitude toward co-operation within the industry I will add that in promoting the sale of additional equipment to the domestic customer there is no question that all branches of the industry, working together, can do a better job than can the utility company alone. In many parts of the country co-operative effort among the utility, the manufacturer, the distributor and the dealer has proved definitely that this combined attack on the domestic market can produce results which the utility, working alone or at odds with the other branches of the industry, could never have accomplished. Fundamentally, dealers will do a constructive sales job and work co-operatively only when the utility has won their confidence and respect.

To sum up, therefore, the task of developing a future wholesale business in the domestic market is by no means a job of selling alone. Rather, it must be a combination of the most advanced sales knowledge and ability, with an intimate appreciation of customer psychology. The groundwork in the development of any such plan must be knowledge, confidence and appreciation on the part of the customer.

This is the job which faces us. Its accomplishment will demand the combined efforts not only of all groups of the electric utility personnel, but of the electrical industry as a whole. In fact, we face an issue far more serious than that of sales—an issue the solution of which may determine not only the future status of this great industry but the economic and social future of the nation as well.

▼ ▼ ▼

Voltmeter Charts Analyzed by New Integrator

By F. W. USBECK
United Electric Light & Power Company, New York

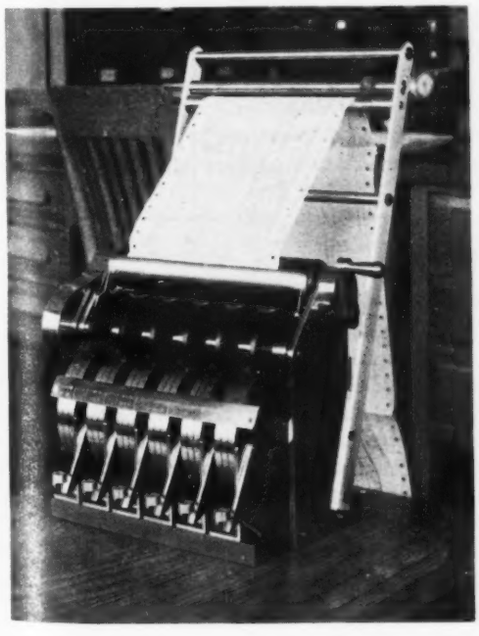
To total the number of chart-hours during which service voltages are within each of five predetermined bands a mechanical integrator has been devised.

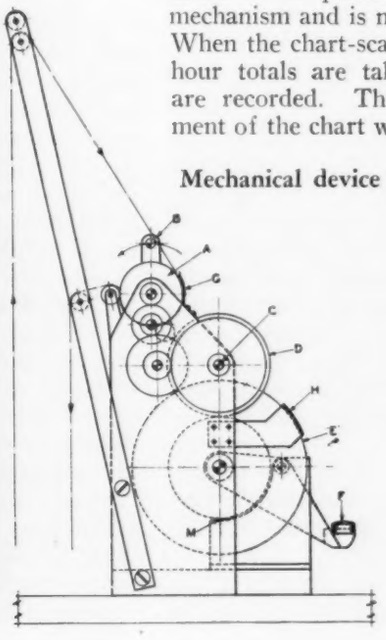
It is the practice of two of the companies supplying electric service in the city of New York to condense for statistical review the large amount of information as to service voltage continuously obtained from recording voltmeters connected to the service mains at various locations throughout the territory served. This involves an analysis to determine the number of chart-hours during which the voltage was within each of five selected bands or ranges of voltage. The results of these analyses are combined in various ways to make up a monthly report showing the trend of average voltage as well as other information of particular interest to the engineers responsible for service voltage conditions.

An average of 13,500 linear feet of charts must be analyzed each month, representing a total of 108,000 operating chart-hours. Inasmuch as the recording voltmeter record appearing on the chart may enter and re-enter several selected bands many times in the length of each chart, a mechanical totalizing device is of great assistance in summarizing the hours of operation in each band. A device of this kind has been developed.

In the device as actually constructed provision is made for its use with voltmeter charts taken from instruments of three different manufacturers and having different time scales. This is done by engraving three parallel scales on each of the drums *E*, the scales being chosen to read directly in chart-hours for the particular type of chart being scanned.

In scanning the chart the operator turns the crank with one hand at a speed which enables him to discern the band in which the voltage indication belongs. As each key is depressed drum *E* engages with the driving mechanism and the drum rotates until the pressure is removed from the key. A totalizer drum similar to drum *E* is permanently connected with the driving mechanism and is not affected by movement of the keys. When the chart-scanning operation is finished the chart-hour totals are taken from the individual drums and are recorded. The totals agree with direct measurement of the chart with an error of less than 2 per cent.



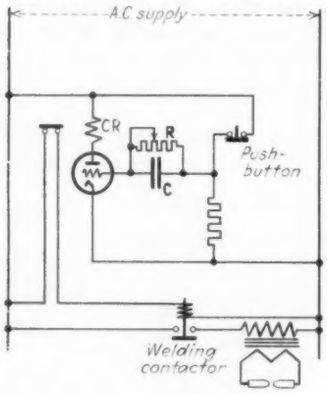


Mechanical device integrates service voltage fluctuations

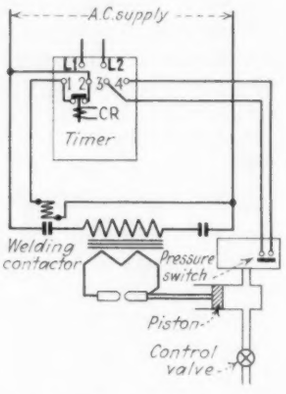
Each chart is about 20 ft. in length and is inserted at roller *A*. This roller turns through the action of crank *B* and is connected through a reduction gear train to the countershaft *C*. Shaft *C* is equipped with six micarta disks *D* which serve as clutches to turn the integrating drums *E* when the keys *F* are depressed. In order to prevent creepage of these drums, with a resulting error of integration, the drums are designed to rest on a felt pad *M* when idle. The paper guide *G* serves as a reference line for observing the trend of recorded voltage. The metal strip *H* is engraved to indicate the voltage band with which each drum is associated and the top edge of this strip serves as a reference line for reading the chart-hours from the drums.

Uniform Spot Welding With Automatic Timers

Probably 100,000 or more electric spot welders are in use, the majority of which do not have automatic timing of the weld, so essential to the production of uniform welds, reduction of rejects, elimination of inspections, speed in welding, etc. Facilities have been provided in the last few years which can be applied to existing



Electrostatic weld timer in simplest form



Application to hydraulic or pneumatic welder

machines for providing the correct timing to all work even though the welders be manually, pneumatically or hydraulically operated. Two methods were described and the performance discussed at the recent meeting of the American Welding Society by Carroll Stansbury, Cutler-Hammer, Inc., and D. C. Wright, Electric Controller & Manufacturing Company. Both were electrostatic timers.

In its simplest form, said Mr. Stansbury, the electrostatic timer consists of a single thermionic tube of either vacuum or gaseous type, a condenser *C*, which is normally kept charged to a definite value between timing operations, and an adjustable resistor *R*, through which the charge on the condenser discharges during a timing period. The pilot device is a normally closed push-button, for which, of course, may be substituted a limit switch actuated by the movement of the mechanical linkage associated with the welding electrodes.

In operation between timing periods the tube is conductive so that the magnetic relay *CR* is kept energized, holding open its contacts and keeping the welding contactor de-energized. Operating the pilot switch results in de-energizing the coil of the *CR* relay, due to the resulting blocking action of the charge on condenser *C* on the tube, so that the contacts of relay *CR* close, energizing the welding contactor for a timing period, depending on the time of dissipation of the charge on *C* through adjustable resistor *R*. Various improvements and refinements of this simple unit have followed in commercial devices.

The automatic welding timer described by Mr. Wright includes a small current transformer, a simple double-wave rectifier tube, a condenser, an adjustable resistor, two neon glow tubes and two small relays. The transformer is connected in series with the primary of the welder. The secondary of the series transformer supplies a.c. voltage for the rectifier. The rectifier supplies d.c. voltage to the condenser in proportion to the a.c. current flowing in the welder. When the charge to the condenser has received a predetermined voltage it discharges through the neon tubes in series with the coil of one of the relays, causing this relay to operate the second relay, which, in turn, opens the welder contactor.

The adjustable rheostat is connected in series with the condenser. Its setting depends upon the character of the work being done, upon the welder transformer tap chosen, upon the general thickness of material and upon the alloy of the material being welded. In order to insure the proper time setting of the rheostat a few sample welds should first be made to determine the proper tap setting of the welder and the proper time setting for the work at hand. After these have been determined by careful examination and tearing apart of the welds the tap and time setting can be left alone, even though large variations occur in the character of material or in the resistance of the circuit.

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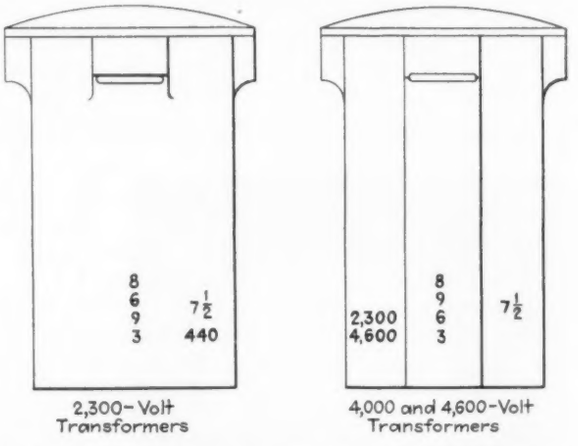
Marking Aerial Transformers

Systematic marking of aerial transformers has been standardized on the New England Power Association properties to facilitate distribution department work, safeguard linemen and speed up inventory activities in the field. Two standards have been adopted, one for 2,300-volt and the other for 4,000-volt and 4,600-volt transformers.

Transformer numbers are placed on the lower half of the front not less than 3 in. from tank bottoms, except with corrugated tanks, where numbering is on the upper part of the tank in the same relative location. White



Typical marking locations for aerial transformers

paint is used, with numbers from 2 in. to 3 in. high. Primary voltage is indicated horizontally at the left except with 2,300-volt transformers, which are conventionally of the latter voltage unless otherwise indicated. If transformer primaries may be connected for more than one nominal voltage, all available nominal voltages are shown. The transformer number is placed vertically at the center. Horizontally at the right the rating in kva. is placed, and if the secondary two-wire voltage exceeds 300 volts this is shown below the rating figures.

On new steel-tank transformers painted with lacquer or equivalent, the marking is made more permanent by roughing it with fine sandpaper, giving the marking when dry a coat of clear varnish. Boosters, insulating and auto-transformers, if incased in distribution transformer tanks, are required to be painted red over the entire surface.

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Lighting for Artificial Skylight

By ROY A. PALMER

Illuminating Engineer Southern Public Utilities Company, Charlotte, N. C.

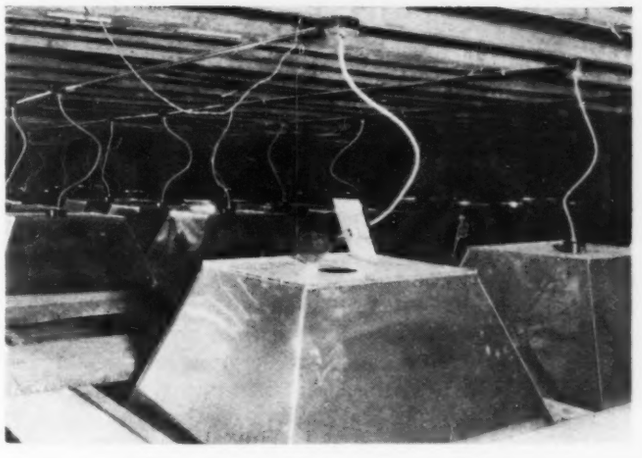
A recent fire destroyed the main banking room of the American Trust Company, Charlotte, N. C., which necessitated complete remodeling. Since the artificial lighting in the old banking room had been selected on the basis of appearance, rather than illuminative effectiveness, there had been a constant complaint about the poor lighting from the workers in that section of the bank. The demand for better lighting had been so pronounced that when the remodeling was necessary the primary consideration was to provide a lighting system that would alleviate the suffering which those in the working area were experiencing from eye strain.

The bank officials expressed preference for a lighting system which would not involve fixtures suspended from the ceiling. An artificial skylighting system was suggested by an electrical contractor. The idea met with favor, especially since the proportions of the room would be improved by a lower ceiling. Accordingly, a new ceiling 4 ft. lower than the original ceiling was designed with a skylight of 64 glass panels, each approximately 3 ft. square.

The usual method of providing artificial lighting for skylights is by a system of reflectors suspended above the glass. Where daylight is utilized during the daytime this method of artificial lighting must be used in order to minimize obstruction of daylight by the fixtures and wiring equipment. However, this system is quite inefficient, and where daylight is not utilized it is actually too wasteful of light to be economical.

There are three objections to the usual method of suspending reflectors above the skylight: First, the light which does not strike the glass is spilled upon the beams, plaster, glass frames, etc., above the skylight and is either absorbed by them or reflected upward and lost completely, since there is no satisfactory reflecting surface above to intercept it and redirect it back to the glass; second, the light which strikes the upper and lower surfaces of the glass is reflected upward and lost in the same manner; third, the heat generated by the lamp in the reflector sets the air in motion, which raises dust that quickly settles on the glass, thereby depreciating the entire lighting system.

The method used in the American Trust Company greatly overcomes these disadvantages. An aluminum box having an oxidized reflecting surface inside was constructed to fit over each glass panel. These boxes are approximately 3 ft. square at the bottom, 2 ft. square at the top and 2 ft. high. The boxes conserve the light within the area of the glass so that none is lost, as is the case when deep bowl reflectors are suspended over the glass. Light reflected from the glass surfaces is intercepted by the oxidized reflecting surfaces of the boxes and redirected downward toward the glass, with the result that a greater percentage of light is transmitted through the glass than with the other system. The boxes are set on strips of felt placed around the frame to minimize the dust accumulation within the box. Any circulation of air within the box will, therefore, not be effective in causing dust to collect on the glass.



Unusual artificial skylighting of bank

The wiring is arranged in conduit over the rows of boxes, with an outlet box directly over each reflecting box. Flexible conduit leads from this outlet box to another box fastened to a small square of aluminum which holds the socket and which can easily be clamped into position by twisting the corners of the square into lugs riveted to the top of the reflector. This arrangement facilitates lamp renewals.

Each of the 64 reflector boxes is equipped with a 200-watt lamp which provides a level of 22 foot-candles at the tellers' desks.

READERS' FORUM

Water Friction Losses Exceed Electrical

To the Editor of the ELECTRICAL WORLD:

To me it seems that an error is made in the first line of Table I in T. G. LeClair's article entitled "Plant Location in Relation to Coal, Water and Electric Load" in your September 16, 1933, issue, page 375. As the load is wanted at the Northwest station the smaller capacity would be required for the Northwest station. Transposing the 307,500 and 312,000 kw. capacity will change the capital investment $450,000 for both Ridgeland and Northwest; $900,000 at 12½ per cent equals $112,500. The excess of Ridgeland over Northwest should be approximately $450,000 instead of the $350,000 shown.

The more interesting facts disclosed by the tables are:

Coal per kilowatt-hour at Northwest	$0.00210
Coal per kilowatt-hour at Powerton	$0.00175
Difference	$0.00035
Yearly savings on 300,000-kw. station at 60 per cent load factor.	
300,000 × 8760 × 0.60 × 0.00035	$551,880
$551,880 equals fixed charges for $4,415,000 at 12½ per cent.	
From Table I:	
Three 130,000-kva. step-up transformers 22/230 kv. with regulators and low-tension switches	$1,500,000
Two 220-kv. terminals, seven switches each	850,000
One 50,000-kva. condenser and switches	1,050,000
Three 120,000-kva. step-down transformers 66/230 kv. with low side switches and regulators	2,100,000
Total for step-up and step-down equipment	$5,500,000
Yearly savings (shown above) allowable investment.	4,415,000
Excess investment	$1,085,000

Thus it is evident that 230-kv. lines are not economical for the Powerton station as every mile of transmission line will increase the excess investment shown above. If a smaller capacity station is used the price per kilowatt of capacity is larger, thus will be more uneconomical than the one used above. Likewise, if a 230-kv. line is built and smaller substations are used to distribute the load to several communities the unit cost will be higher.

Warrensburg, Mo. H. G. BERKEY.

In answer to the letter by Mr. Berkey, the tabulation in my paper was correct in stating that generating capacities of 312,000 kw. and 307,500 kw. at Northwest and Ridgeland Avenue respectively were needed to supply a net output of 300,000 kw. to the Northwest bus. The brief abstract did not explain why more capacity is required at Northwest than at Ridgeland.

The capital cost of excavating solid rock tunnel is so great that the most economical design uses a high velocity of water flow. Consequently the friction loss in pumping water through the tunnel is not negligible. In this illustration the most economical tunnel design introduces friction losses in the 8 miles of tunnel from the lake to Northwest and back again which are greater than the electrical losses to transmit the corresponding amount of energy through 14 miles of underground cable from the Ridgeland station.

Referring to the second paragraph in Mr. Berkey's letter, the recapitulation does not apply exactly as the design and cost of terminals will vary with the length of line involved. However, this difference does not change the conclusions, which agree with those in my original paper.

I appreciate Mr. Berkey's interest in analyzing this article so carefully and pointing out what other readers may also have thought to be an error.

T. G. LeCLAIR,
Development Engineer.

Commonwealth Edison Company, Chicago, Ill.

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BOOK REVIEWS

McDonald's Electrical Dictionary

By George McDonald. Published by Meador Publishing Company, Boston, Mass. 178 pages. Price, $1.50.

More than two thousand terms out of the field of electric practice are defined with sufficient rigidity and completeness for the practicing engineer and electrical technician. It is naturally not as highbrow and meticulous as what the American Standards Association will shortly put out under A.I.E.E. sponsorship. Nor is it merely an electrician's or electrical experimenter's savior. Thus "sinusoidal," "vector" and "electron" are missing, but "peak value," "quadrature," "joule" and "kilocycle" are present, along with "telautograph," "fishing box" and "safe carrying capacity."

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Les Courants Alternatifs—Methods Générales pour le Calcul des Courantes Sinusoïdaux

(General Methods for the Computation of Sinusoidal Currents)

By A. Blondel. Published by Librarie J.-B. Ballière et Fils, 19, Rue Hautefeuille. 695 pages, 258 illustrations. Price, paper 140 francs, bound, 155 francs.

The distinctive feature of this rather substantial volume is that in it the author compares and discusses various mathematical methods for the analysis of circuits and the functioning of alternating-current equipment. This treatment leads, in the latter part of the book, to problems involving hyperbolic, cylindrical and other functions relating, for example, to long lines, polyphase systems and current distribution in conductors of various shapes in air or in magnetic media.

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Potentialfelder der Elektrotechnik

(Potential Fields in Electrical Technology)

By Franz Ollendorff. Julius Springer, Berlin. 395 pages, 244 illustrations. Price, 32 reichsmarks.

The preface states that the material is expanded from a lecture course regularly given by the author at the Berlin technical college. The treatment is essentially theoretical, but leads into a variety of practical problems in electrostatics, magnetostatics and current flow involving vector mathematics. For example, equations are derived for the ground resistance of damp soil overlaid by dry, field of a thundercloud, fields of polyphase lines and cables and around insulators.

Men of the Industry

WILLIAM L. THRAILKILL, for the past six years connected with the state Department of Public Works, Olympia, Wash., has been appointed to the engineering department of the Washington Water Power Company.

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A. M. SWEENEY has been appointed sales manager of the electric refrigeration department of the General Electric Company. Mr. Sweeney became associated with the General Electric organization immediately after his graduation from Harvard in 1910.

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A. E. KENNELLY, professor emeritus of electrical engineering at Harvard University, Cambridge, Mass., has been elected a member of the International Committee on Weights and Measures. Doctor Kennelly represented the United States at the general conference on weights and measures which was convened at Paris, France, last month.

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M. F. MAHONY, who has been connected with the electric refrigeration department of General Electric Company since its organization in 1927, has resigned as manager of the merchandising division to organize his own corporation, Mahony & Company, which will specialize in sales campaigns and merchandising service, with headquarters in Cleveland. A. L. SCAIFE, who has been connected with the department's merchandising division for the past five years, was named manager of the newly created retail division and will be in charge of sales training. The merchandising division, as such, has been discontinued. Mr. Mahony had been identified with General Electric for twelve years.

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A. V. GUILLOU has resigned as chief engineer for the Public Service Commission of Wisconsin, to assume similar duties in the office of the city attorney in the city of Los Angeles, Calif. A graduate of the University of California, Mr. Guillou obtained his early experience with the Westinghouse Electric & Manufacturing Company and subsequent connections followed with the Pacific Light & Power Corporation, Mount Whitney Power & Electric Company and the Southern California Edison Company. In 1920 he joined the staff of the California Railroad Commission and as gas and electric engineer had supervision of investigations and reports on rates, service costs and construction projects of gas and electric utility companies. In 1926 he became assistant chief engineer, resigning in 1931 to become chief engineer of the Public Service Commission of Wisconsin. In the position which he has just assumed he will handle the engineering phases of the public utility work of that office.

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Julian C. Smith Heads Canadian Utility

Julian C. Smith, vice-president and general manager of the Shawinigan Water & Power Company, has been named president of the company to succeed J. E. Aldred of Boston, who has resigned to become chairman of the board of directors. A prominent figure in the Canadian public utility industry for a number of years, Mr. Smith

joined the Shawinigan Falls company as an engineer during the time of the construction of the company's first power house. He was born in Elmira, N. Y., and was graduated from Cornell University. Since 1903 he has been connected with the Shawinigan utility in the capacity of superintendent, general superintendent and chief engineer, vice-president and general manager. Mr. Smith has served as president of the Engineering Institute of Canada and is a member of the British Institution of Electrical Engineers, the American Institute of Electrical Engineers and the American Society of Civil Engineers.

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CAMERON DE WITT JARVIS, engineer of foreign wire relations for the New England Telephone & Telegraph Company and one of the most widely known communication engineers in the northeastern power industry, has retired after 41 years of service. Mr. Jarvis' work in inductive co-ordination and electrolysis includes important contributions to equipment design for measurement and test purposes in addition to participation in the solution of many specific problems arising in inter-utility relations. His successor is Harry L. Jones, with headquarters at Boston, Mass.

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OBITUARY

FREDERICK B. SAGE, for 31 years connected with the New York office of the Cochrane Corporation, with main office and works in Philadelphia, died October 30. He was graduated from Lehigh University in 1893 and was engaged in electrical work until 1902, when he joined the staff of the Cochrane organization in New York.

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FLOYD A. NAGLER, professor of hydraulic engineering, University of Iowa, died November 10, of peritonitis. Born in Howard City, Mich., in 1892, he was graduated from the Michigan Agricultural College and University of Michigan. Since 1920 he had been connected with the University of Iowa and in addition served many clients, including U. S. Army engineers, in a consulting capacity. He was a prolific writer and gave freely of the results of his various experiments. He was a member of the Society for the Promotion of Engineering Education, Iowa Engineering Society, the American Society of Civil Engineers and of other technical associations.

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THORBURN REID, retired electrical engineer, died suddenly November 10 at Mountainside Hospital, Caldwell, N. J., in his seventieth year. After serving as instructor of mechanical engineering at the University of South Carolina, he became head of the testing department of the United States Electrical Illuminating Company in New York and Schenectady. From 1891 to 1897 he was with the General Electric Company in Schenectady and Lynn, Mass., and from 1912 to 1925, when he retired, with the Simms Magneto Company of East Orange as head of its cost department. Mr. Reid was a life member of the American Institute of Electrical Engineers.

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WILLIAM A. FERGUSON, recently connected with the Union Electric Light & Power Company, St. Louis, Mo., died September 10, in his sixty-third year. After preliminary engineering experience with the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Mr. Ferguson spent several years on the road, inspecting light, power and railway plants. In 1901 he went to Mexico City to reconstruct the substation of the local hydro-electric company, resigning two years later on account of sickness. He then became

connected with the Mexican Light & Power Company as electrical engineer in charge of construction work in Mexico City and vicinity. Subsequently he spent many years in New York City, Mexico, Cuba and South America for the Electric Bond & Share Company.

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BRIG.-GEN. HARRY C. TREXLER, industrialist and financier of Allentown, Pa., died November 17 in the Easton Hospital, Easton, of injuries received in an automobile accident. Public utilities which he served as an officer or director included the Pennsylvania Power & Light Company, the Lehigh Valley Traction Company, the Lehigh Valley Transit Company, the Consolidated Telephone Company of Pennsylvania and the Lehigh Telephone Company. General Trexler was 79 years of age.

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BYRON T. BURT, vice-president of the North American Utilities Corporation, Jersey City, N. J., died October 3, in his seventy-third year. Early in his career, as employee of the Thomson-Houston Electric Company, he installed many pioneer lighting plants. After spending several years in Central America and abroad he returned to this country, entering the employ of the General Electric Company. Later connections were with the Charleston (S. C.) Light & Power Company, the Des Moines Edison Light Company and the Chattanooga Light & Power Company. Subsequently he became special engineer for the North American Company, New York, N. Y. Mr. Burt was a fellow and a life member of the American Institute of Electrical Engineers.

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HENRY H. WESTINGHOUSE, chairman of the board of directors of the Westinghouse Air Brake Company, an outstanding mechanical engineer and brother of George Westinghouse, founder of the Westinghouse industries, died November 18 at his home in Goshen, N. Y., following a prolonged illness. A native of Central Bridge, N. Y., he entered Cornell University in 1871 and one year later became identified with the Westinghouse Air Brake Company. Although not in recent years actively engaged in the management of the company, he still retained a deep interest in its operations and exerted a notable influence in shaping its policies. In 1881 he organized the Westinghouse Machine Company to manufacture the Westinghouse single-acting steam engine, patented and developed by him, which was a vitally important factor in the electric power industry. In 1885, he formed the engineering firm of Westinghouse, Church, Kerr & Company and was its president for many years.

New Equipment Available

Automatic Step-Voltage Regulator

An automatic step-voltage regulator which is particularly applicable for maintaining constant voltage on suburban and rural circuits of 4,800 volts or more and for regulating low-voltage, high-current city distribution feeders where the service will permit has been announced by the Westinghouse Electric & Manufacturing Company.

This new type UR regulator is available in either single or polyphase design for 10 per cent regulation with seventeen points of 1¼ per cent steps or 33 points of ⅝ per cent steps. It consists of a regulating auto-transformer and a load changer built into an integral unit arranged for outdoor operation. Regulation of the circuit is accomplished by changing taps under load on the regulation auto-transformer. Taps and leads from the regulating auto-transformer are brought to the transfer switches and to the reversing switches. The transfer switches perform all of the load-switching operations and all arcing is confined to these switches.

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Motor Suspension for Ceiling Drives

Important advantages are claimed by the Rockwood Manufacturing Company for its new motor suspension for ceiling drives. Too often ceiling drives constitute a trouble zone for plant maintenance men, the belts stretch and lose their tension and because the drives are inaccessible it is difficult to give them the attention they require. These difficulties are stated to be overcome in the new drive because there is no need to take down shaft hangers, the belt may be made endless on the job, quick adjustment for belt tension and pulley alignment is possible, etc.

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AN ELECTRICAL DEVICE providing improved automatic door-opening service for garage doors has been announced by the Barber-Coleman Company, Rockford, Ill. It consists of a magnetic latch which holds the door closed until it is released by a control switch, whereupon tension in balance springs of the door pulls the latter open.

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NO-ARC MERCURY TUBE SWITCHES made in 1, 2, 3 and 4 poles, each pole consisting of a mercury tube switch with ratings of 30 amp., 125 volts; 20 amp., 250 volts, either a.c. or d.c., for controlling inductive loads, such as multiple street-lighting circuits, have been announced by the Hart Manufacturing Company, Hartford, Conn.

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Globe for Floodlighting Low Buildings

A shell globe that is particularly applicable for floodlighting comparatively low buildings where it is desirable to use units having an architectural appeal combined with good light distribution has been announced by the General Electric Company. When mounted on standards and installed along the curb line the complete unit is a desirable addition to the street as well as an efficient lighting unit for the property owner. It is an efficient floodlighting unit because of the shape and reflecting qualities of its surface. Lamps as high as 10,000 lumen rating may be used.

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A NOISE LOCATOR designed to meet the need of public utilities, municipalities, manufacturers and engineers for a portable instrument to be used in tracing radio noise to its point of origin and in locating such line faults as give evidence of their presence by causing radio-frequency disturbances has been announced by the Tobe Deutschmann Corporation, Canton, Mass.

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ANNOUNCEMENT OF AN S&C "LOAD-GARD" which it is claimed is economical compared to other automatic equipment has been made by Schweitzer & Conrad, Inc., Chicago. Some of the outstanding features of this device are high interrupting capacity, definite time delay between the clearing of a short circuit and the reclosing of the circuit through the S&C reclosure feature, fully protected from weather conditions, no external parts to get out of order, resulting in reliable operation under all conditions, etc.

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OPEN FUSE CUTOUTS incorporating a drop-out feature which gives the lineman positive indication that the fuse has been blown and the circuit opened at that point have been announced by the General Electric Company. A new fuse link can be quickly and easily installed. The fuse holder can be removed or installed with a standard switch hook. These cutouts are available in two voltage ratings, 7,500/12,500Y and 15,000 volts. Both can be fused from one to 60 amp. and have 1,200-r.m.s-amp. interrupting capacity.